



Washington State Transportation
Commission

Statewide Rail Capacity and Needs Study

first interim report

prepared for

Washington State Transportation Commission

prepared by

Cambridge Systematics, Inc.

with

Berk & Associates, Inc.

Global Insight, Inc.

HDR, Inc.

Starboard Alliance Company

Transit Safety Management

Willard F. Keeney & Associates)

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Executive Summary

WHAT IS THE PURPOSE OF THE STUDY?

The Washington Rail Capacity and System Needs Study was initiated by the Washington State Legislature in response to growing concerns about how effectively the State's rail system is meeting transportation needs. The purpose of the study is to assess the rail freight and rail passenger infrastructure needs in Washington State, and recommend public policies for state participation and ownership in rail infrastructure and service delivery, including but not limited to planning and governance issues. Specifically, the Legislature, in its 2006 to 2007 budget proviso, directed the Washington State Transportation Commission to conduct a study to:

- Assess the rail freight and rail passenger infrastructure needs in this State;
- Review the current powers, authorities, and interests the State has in both passenger and freight rail;
- Recommend public policies for state participation and ownership in rail infrastructure and service delivery, including but not limited to planning and governance issues; and
- Develop a rail asset management plan.

WHAT ARE THE KEY CONCERNS THAT ARE DRIVING THE STUDY?

Citizens and businesses in Washington State look to rail as a critical component of the multimodal freight and passenger transportation systems. Rail can provide a low cost, relatively fuel efficient and relatively clean transportation option for many categories of users. There have been recent indications that the rail system in Washington State may not be able to effectively provide this option now and in the future. Specific concerns about the rail system include:

- **The passenger rail system requires major investment to achieve desired levels of service frequency, quality, and ridership.** The existing state inter-city rail program outlines major capital investments that will be needed to increase service frequency, eliminate some of the conflicts with the freight-rail system, and eliminate capacity bottlenecks. This is expected to lead to substantial increases in ridership that would potentially allow the system to cover operating expenses from revenues. But the program is not fully funded for all the necessary investments. Proponents of the program argue that at forecasted ridership levels, the benefits of the program in terms of potential congestion reduction, fuel efficiency, and emissions reduction as compared to auto travel are substantial. Opponents argue that these benefits

could be achieved more cost-effectively by other modes, and that the limited rail capacity could be used more effectively to meet freight transportation needs. The passenger investments will also create capacity and operational improvements that provide benefits to the freight-rail users of the corridor. There is disagreement as to what the actual value of these benefits to freight-rail users and carriers are and consequently, how the costs of the improvements should be shared between the public and private sectors.

- **Trade growth is swamping the freight-rail system and, if capacity constraints are not addressed, this will threaten the competitiveness of the State's seaports and will cause problems for certain Washington State shippers and receivers and for passenger rail users.** Container imports through the Ports of Seattle and Tacoma, like those through all West Coast ports, have experienced enormous growth over the last several years; and forecasts suggest that international intermodal cargo will overtake most other traffic as the leading source of cargo on the Washington State rail system. Unit grain trains from outside of the State are also a leading rail commodity, heading for the Lower Columbia River ports. This is creating a huge capacity crunch, particularly on the east-west rail lines, at terminals, and at access points in and out of the ports. There is strong evidence that capacity shortfalls in the Washington State rail system are having a big impact on the service received by many of the State's traditional carload rail shippers. Passenger rail service is also perceived as suffering from this capacity shortfall.
- **Short line railroads in Washington State are struggling financially.** Not a problem unique to Washington State, short line railroads that have come to provide a critical service to more remote shippers on low density lines are finding it difficult to maintain service quality. They often suffer from deferred maintenance and low capital investment in infrastructure, and current Class I business models often make it difficult for the short lines to offer competitive rates. There are increasing calls for the State to step in and rescue these failing businesses to preserve service options for affected communities and shippers. The State needs a comprehensive strategy to determine if, when, and how it should intervene.
- **Communities want to use their rail access as an economic development tool, but are also concerned about mitigating impacts of rail activity within their communities.** Like the case of the short lines, the appropriate role for the State to play in encouraging economic development around rail investment needs to be guided by a comprehensive strategic policy. In addition, the State may need to play an advocacy role on behalf of communities to ensure that railroad investment brings with it appropriate mitigation of noise, emissions, safety, and delay impacts.

WHAT IS THE PURPOSE OF THIS INTERIM REPORT?

The Washington Rail Capacity and Needs Study is being conducted in three phases. The first phase is a "state of the system" analysis intended to define key

issues and opportunities that will be the focus of policy development in later phases. The second phase will develop the rationale for state rail policy and an analytical approach for evaluating benefits and costs of specific rail policies, programs, and investments. This phase will also define policy options that will be evaluated using the analytical approach. In the final phase of the study, policy packages will be evaluated and a recommended investment plan, asset management plan, and rail governance models will be presented.

This first interim report summarizes the findings and conclusions of the first phase of work examining the state of the rail system, its critical problems and bottlenecks, and current plans. It is essentially a description of how the system is functioning now and how it is likely to function in the future in the absence of state action. Not all of the problems identified in this report should or can be solved by government intervention, but an effective set of strategic policies must proceed from an understanding of the roles and likely actions of all key stakeholders, public and private, local or global. In subsequent phases, the consultant team will define policies that could lead to changes in the way the system will function in the future and that will satisfy state economic and transportation goals and objectives. In order to evaluate how effective these policies will be, it is critical to understand how and why the system functions as it does with the current government programs.

FINDINGS OF PHASE I

The Washington State rail network is at or near capacity now; service quality is strained and rates are going up. The study evaluated current train volumes on all main lines and compared these volumes with practical capacity (capacity at which trains on the system are all moving without incurring significant delay or experiencing significant operational problems) (see Figure ES.1). This analysis shows that capacity is most severely constrained in the east-west corridors and north of Seattle. The line from Everett to Wenatchee over Stevens Pass is already congested, and lines from Wenatchee to Spokane, Vancouver to Wishram, and Pasco to Lind are all severely constrained. The line over Stampede Pass, while not congested today, is severely limited as a reliever route because the Stampede Tunnel lacks clearance for double-stack trains. Future growth, most notably in intermodal volumes through the ports, will worsen this situation even with the operational changes that the Class I railroads are making to try to increase velocity without major infrastructure investment. Additional analysis shows that, while the north-south line between Seattle and Vancouver, WA is not capacity constrained on the mainline, there are numerous bottlenecks, many related to terminal capacity shortages and port access, that affect operations in this corridor today (see ES.2). This is likely to worsen as capacity constraints over Stevens Pass force more intermodal traffic south to the Columbia River Gorge.

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Figure ES.1 Statewide Counts Capacity

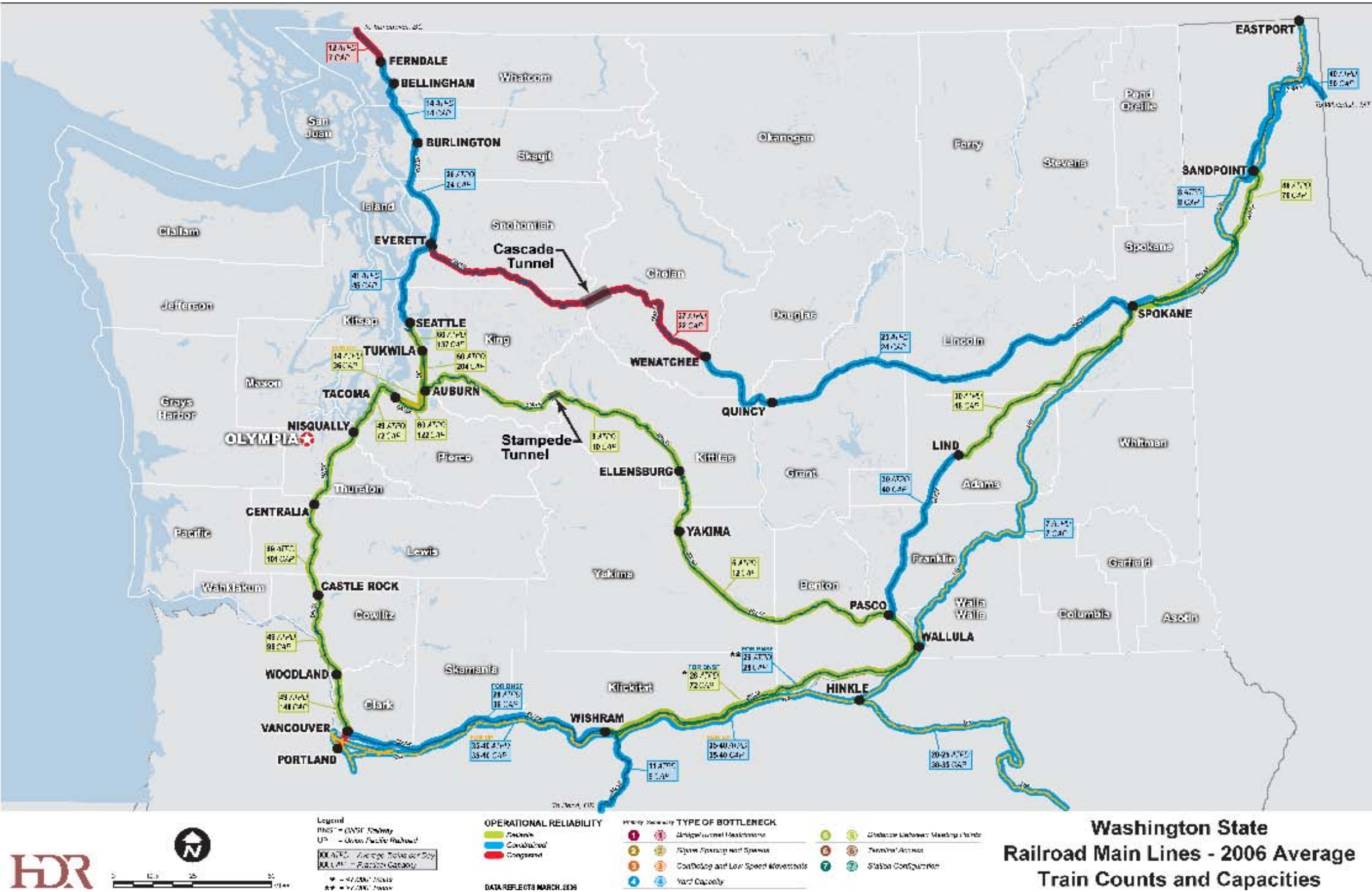
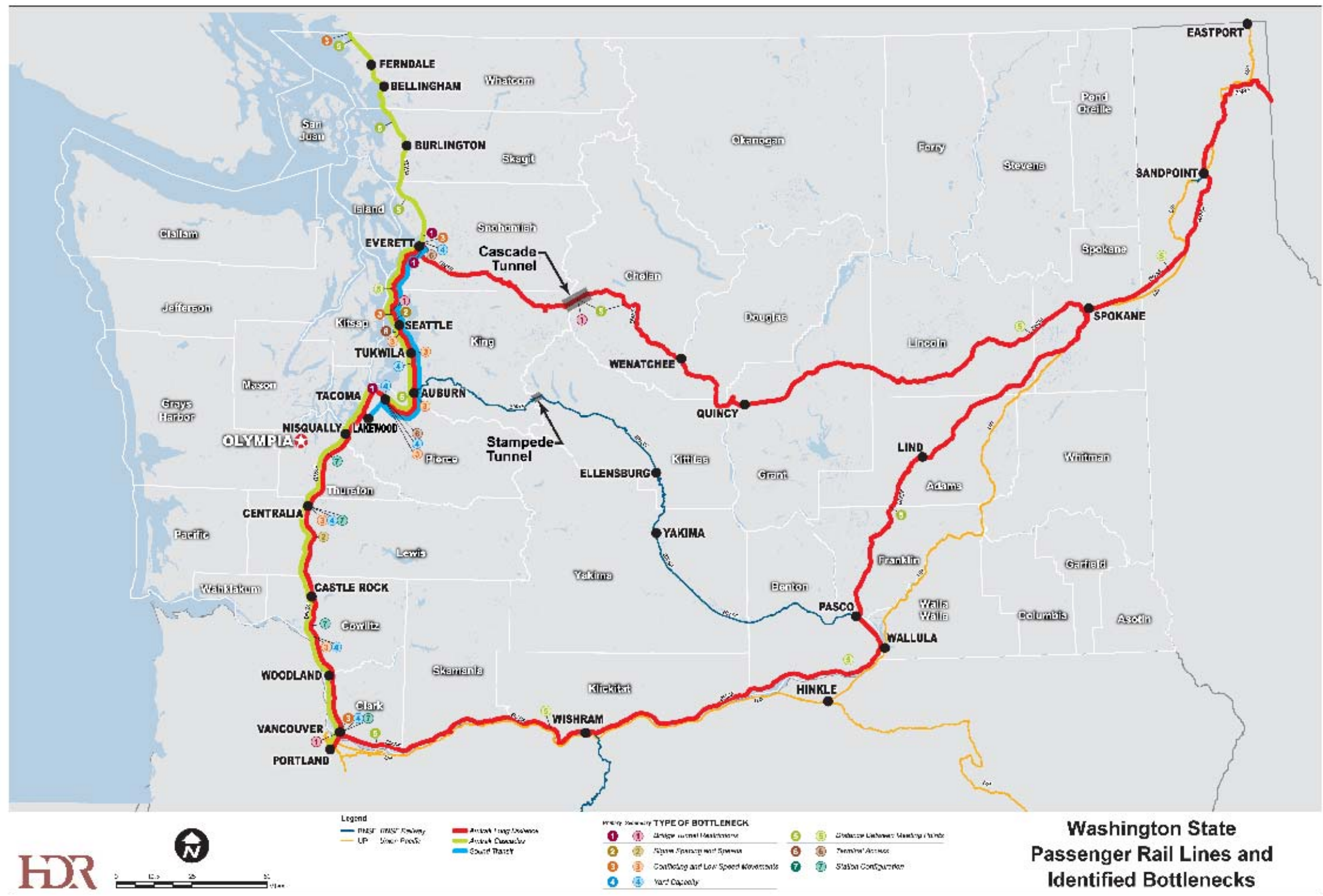


Figure ES.2 Major Bottlenecks in Washington State Rail Network



Freight demand for use of the Washington State rail system is growing, but much of this growth is driven by shippers and receivers outside of the State. Today the largest volume of traffic by tonnage moving on the rail system in Washington State is agricultural products moving inbound. This is mostly grain exports coming from the interior U.S., and it is increasingly moving on large unit trains. Volumes of these products are expected to continue growing and needing capacity on the Columbia River Gorge lines. Intermodal cargo represents the second largest category of cargo by tonnage and the largest in terms of number of rail cars. This is projected to be the fastest growing component of Washington State freight-rail demand. Most intermodal cargo is moving from the ports into the interior U.S. Despite the dominance of intermodal imports and agricultural exports in the future rail traffic picture for Washington State, there are local industries that will generate growth opportunities for the railroads. Waste and scrap material is a fast growing cargo that is mostly local in nature. Transportation equipment and lumber and wood products are rail cargoes manufactured by local industries that also show growth potential. The problem with these cargoes is that they move in carload manifest trains and often come to the railroads in small volume per shipper in widely varying car types for widely varying origins and destinations. If the Class I railroads continue to prefer intermodal and bulk unit train traffic to mixed carload, Washington State rail shippers may need to look to alternative rail transfer approaches or risk further declines in service.

The railroad industry is not keeping pace with demand. Railroading is one of the most capital intensive industries in the U.S. Much of the capital investment is devoted to replacing “used up” capacity as rail traffic places enormous wear and tear on underlying infrastructure. Railroads also spend much of their capital budgets on power and other equipment. This does not leave much left over for adding new capacity. Capacity limitations and the recent surges in demand have allowed Class I railroads to increase their rates and profits and for the first time in many years, they are earning returns that cover their cost of capital. But even in this situation, the Class I’s are being very cautious in their investment strategies. Both the Burlington Northern Santa Fe (BNSF) and the Union Pacific (UPRR) have investment strategies that emphasize increasing velocity through the system by operations strategies first and infrastructure expansion last. They are also focusing much infrastructure investment on the highest density, most competitive, and most politically sensitive corridors (Pacific Southwest and the lines out of the coal fields of the Powder River Basin).

Class I railroads are attempting to change their business model. The railroads are trying to emphasize long haul, hub-to-hub or point-to-point, service in high density corridors. This is the least operationally complex type of service, and it takes advantage of the low average cost of line-haul movements. The railroads are also attempting to change operational practices to get more throughput from existing infrastructure. This has meant practices such as building longer trains, standardizing equipment with fewer car options, trying to get customers on industrial leads and spurs to make site improvements, and supporting transload centers and consolidation facilities. In some instances, these operational changes

are working to improve productivity but in other cases they are creating new operational challenges (for example, longer trains that cannot access terminals and end up blocking mainlines and crossings). Railroads are also using pricing as a demand management tool to encourage traffic that is easiest to serve and most profitable, and to discourage traffic that is difficult to serve and least profitable.

Short line railroads will continue to play an important role serving carload traffic in Washington State, but some of the most financially tenuous lines will find it difficult to offer quality of service that is necessary to retain markets. For those short lines that can accommodate to the new business models of the Class I's (consolidating traffic and delivering it to the Class I's as they wish to receive it), rates will be favorable and they will see an increasing share of carload traffic coming their way. But a number of short lines in the State are not able to offer service that can meet shipper transit time and cost needs. In some cases, the shippers are already moving to alternative modes and their products are still competitive. In the agricultural markets of Eastern Washington State, it may as often be the smaller grain loading facilities that suffer if short lines fail.

International trade growth will continue to dominate growth in rail traffic and rail connections will be critical to port competitiveness. The forecasts prepared for this study show significant growth in container trade with Asia and much of this will end up on a train going east out of the Port of Seattle or the Port of Tacoma. Grain exports through the Columbia River ports are also expected to continue rapid growth. A number of recent studies suggest that there will be time periods over the next 30 years in which some ports will have insufficient terminal capacity and rail access to meet throughput demands. Ocean carriers and importers will move their cargo through a variety of ports to mitigate the impacts of this type of shortage. In addition, ocean carriers and importers will also move rapidly to shift cargo from one port to another in response to rate competition and landside access issues. Forecasts for the Ports of Seattle and Tacoma have already been adjusted downward over the last year to reflect a rebound in service and rail access improvements in Southern California in response to rail congestion problems in that region. While there will be enough trade traffic for all West Coast ports to experience growth, there will be competition and rail access will be an important factor in this competition.

Passenger rail ridership in Washington State is effectively capped by current capacity, bottlenecks, and associated limitations on service frequency. Passenger rail will continue to compete for access to capacity on a strained rail network. There are a number of critical bottlenecks that must be resolved in the north-south corridor if intercity rail service in this corridor is to be able to increase without serious deterioration in service quality. This corridor is also likely to become capacity constrained based on freight growth projections alone, especially if the only viable alternative to the Stevens Pass route is the Columbia River Gorge route (which must be accessed from the north-south corridor).

CONCLUSIONS OF PHASE I

Ensuring future competitiveness of Washington's international trade ports will require the resolution of a mix of mainline capacity, access/egress, and intermodal terminal capacity issues. This will require partnerships among the ports, the State, the Class I railroads, and local governments and may require the use of new financing mechanisms. This study projects significant growth in international intermodal cargo moving through the Ports of Seattle and Tacoma. This is consistent with Pacific Rim trade forecasts for which all of the West Coast ports in North America are planning. In terms of rail car units and trains, this could be the driver of rail traffic growth on the Washington rail system. These ports and the trade-related services that they provide bring substantial economic benefits to Washington State and the nation as a whole. However, the level of growth forecasted is subject to competitive pressure. The existing capacity constraints and local bottlenecks could affect the ability of the ports to achieve forecasted growth. Planning for the future needs of the intermodal rail system supporting international trade from Washington seaports requires a comprehensive approach that links tradeoffs in operations with infrastructure investment strategies. Solving the problems facing this system will also require an expensive mix of mainline capacity improvements in the east-west rail corridors, bottlenecks in the north-south corridor, local access improvements linking the ports and intermodal terminals with the mainline, and additional intermodal terminal capacity. The ports, the State, the Class I railroads, and local governments may all need to contribute in some way to developing these strategies. The next phase of this study needs to evaluate several different comprehensive strategies that include different mixes of infrastructure projects, different funding mechanisms, and different governance structures for implementing the improvements.

Addressing capacity issues alone may not be sufficient to ensure that the Washington State Rail system is responsive to the needs of traditional carload shippers and receivers within Washington State. Given changing business models of the Class I railroads and their approaches to improving velocity through operations, the low density, small shipper markets in which many of Washington State's traditional rail users find themselves are likely to continue to see declines in service even if capacity in the system is increased. The railroads will continue to push customers to new operational practices, and in some cases, this may require that customers make site investments. The State will need a clear policy on how best to address the needs of these shippers in the context of this changing business environment.

Short line railroads in Washington State will continue to have financial difficulties that will affect service quality and availability. The impacts of this situation, while not limited to agriculture, will have its most noticeable impacts in this sector. Short line railroads in very low density corridors will continue to feel financial pressures. Some of this will be the result of changing business models of the Class I's and pricing impacts on the short lines. It will also be the result of competition from new product consolidation facilities that cannot be accessed by existing short lines, as well as the impacts of deferred

maintenance on service quality (and the associated responses of shippers looking for better service). The primary economic impact will not always be on shippers (i.e., it may have primary impact on smaller product loaders and consolidators) and, therefore, should not be assumed a priori to negatively impact the competitiveness of the State's agricultural sector. However, the impacts of declining short line services will have implications for the public sector in terms of potential increases in highway maintenance costs, higher emissions, and lower fuel efficiency. In addressing this problem, the State will need to distinguish between services that can be successfully subsidized, and those that no longer effectively serve the shipper market in their respective communities.

The consequences of insufficient rail capacity in the State rail system are not always an increase of truck traffic on state and local roadways. A primary justification for state involvement in the freight-rail system is that movement of cargo by rail offers public benefits as compared to trucking, especially in congested corridors. This is also a consideration in dealing with capacity conflicts between freight rail and passenger rail. However, in looking at the traffic profile in Washington State, a substantial amount of cargo may be unlikely to divert to trucking if service and capacity continue to be a problem in the Washington State rail system. This is because of the nature of commodities shipped, costs of competing trucking service (and factors such as fuel cost and driver shortages), and the long-haul nature of many of the rail moves. In evaluating the public benefits of freight-rail capacity improvements, the State will need to distinguish between improvements that actually prevent diversion to trucking and those where the impact of lack of capacity is more likely to be higher costs and loss of competitive market position.

The planned long-range investments in the passenger rail system have potential to impact overall rail capacity (both passenger and freight) in the Washington State rail system, but they need to be more clearly linked to a system-level strategy. The existing passenger rail program is geared to addressing the specific capacity and operational issues that affect the ability to achieve the performance and ridership goals for the Amtrak Cascades service. This makes sense in the context in which the money for these programs has been appropriated. However, it would be beneficial for these improvements to be viewed in the broader context of how they address overall rail system mobility needs since improvements in the north-south corridor have impacts on the port rail system, as well as other freight-rail flows. Since current state policy authorizes the State Department of Transportation (DOT) to incrementally address needs for an effective passenger rail service in the Portland to Vancouver, BC corridor, it is often easiest to approach rail investments using the passenger program as the vehicle. In the long run, however, State investment may be able to more effectively leverage contributions from other parties (such as the ports and the Class I railroads) if the investments supporting passenger programs are more clearly linked to a strategic system-level investment strategy. This will require a more comprehensive evaluation of costs and benefits (passenger, freight-rail, and cross-modal benefits) of each investment made by the State.

1.0 Introduction

1.1 BACKGROUND

What Is the Purpose of the Study?

The purpose of this study is to assess the rail freight and rail passenger infrastructure needs in Washington State, and recommend public policies for state participation and ownership in rail infrastructure and service delivery, including but not limited to planning and governance issues.

The Washington Rail Capacity and System Needs Study was initiated by the Washington State Legislature in response to growing concerns about how effectively the State's rail system was meeting transportation needs. The State has had a longstanding involvement in passenger rail service, and recently has provided emergency relief to failing short line railroads and purchased cars to ensure that agricultural shippers in the State have access to service. However, decisions about support for rail projects often have been made on an ad hoc basis without clear long-term policy guidance. The huge and rapid growth in containerized trade through the State's seaports also has caused much discussion. The legislature and the governor are concerned that lack of rail capacity to move intermodal traffic eastward may affect the competitive position of Washington State's ports and possibly jeopardize the jobs generated by the ports. These concerns led to the legislative mandate to the Washington Transportation Commission, spelled out in Figure 1.1, for the Washington Rail Capacity and System Needs Study.

Figure 1.1 Study Mandate from 2005-2007 Transportation Budget Proviso

"...The Purpose of this study is to

- (a) assess the rail freight and rail passenger infrastructure needs in this State;*
- (b) review the current powers, authorities, and interests the State has in both passenger and freight rail;*
- (c) recommend public policies for State participation and ownership in rail infrastructure and service delivery, including but not limited to planning and governance issues; and*
- (d) develop a rail asset management plan.*

The commission shall report their findings and conclusions of this study to the transportation committees of the legislature by December 1, 2006.

A consultant team led by Cambridge Systematics, in association with HDR, Global Insight, Berk and Associates, Transit Safety Management, Starboard Alliance Company LLC, and Willard F. Keeney and Associates, was selected to conduct the study.

1.2 WASHINGTON STATE CONCERNS AND POLICY QUESTIONS

What Are the State's Concerns About Rail Transportation?

The passenger rail system requires major investment to achieve desired levels of service frequency, quality, and ridership. The existing state intercity rail program outlines major capital investments that will be needed to increase service frequency, eliminate some of the conflicts with the freight-rail system, and eliminate capacity bottlenecks. This is expected to lead to substantial increases in ridership that would potentially allow the system to cover operating expenses from revenues. But the program is not fully funded for all the necessary investments. Proponents of the program argue that at forecasted ridership levels, the benefits of the program in terms of potential congestion reduction, fuel efficiency, and emissions reduction as compared to auto travel are substantial. Opponents argue that these benefits could be achieved more cost-effectively by other modes, and that the limited rail capacity could be used more effectively to meet freight transportation needs. The passenger investments will also create capacity and operational improvements that provide benefits to the freight-rail users of the corridor. There is disagreement as to what the actual value of these benefits to freight-rail users and carriers are, and consequently, how the costs of the improvements should be shared between the public and private sectors.

Trade growth is swamping the freight-rail system and, if capacity constraints are not addressed, this will threaten the competitiveness of the State's sea-ports, and will cause problems for certain Washington State shippers and receivers and for passenger rail users. Container imports through the Ports of Seattle and Tacoma, like those through all West Coast ports, have experienced enormous growth over the last several years, and forecasts suggest that international intermodal cargo will overtake most other traffic as the leading source of cargo on the Washington State rail system. Unit grain trains from outside of the State are also a leading rail commodity, heading for the Lower Columbia River ports. This is creating a huge capacity crunch, particularly on the east-west rail lines, at terminals, and at access points in and out of the ports. There is strong evidence that capacity shortfalls in the Washington State rail system are having a big impact on the service received by many of the State's traditional carload rail shippers. Passenger rail service is also perceived as suffering from this capacity shortfall.

Short line railroads in Washington State are struggling financially. Not a problem unique to Washington State, short line railroads that have come to

provide a critical service to more remote shippers on low density lines are finding it difficult to maintain service quality. They often suffer from deferred maintenance and low capital investment in infrastructure, and current Class I business models often make it difficult for the short lines to offer competitive rates. There are increasing calls for the State to step in and rescue these failing businesses to preserve service options for affected communities and shippers. The State needs a comprehensive strategy to determine if, when, and how it should intervene.

Communities want to use their rail access as an economic development tool, but are also concerned about mitigating impacts of rail activity within their communities. Like the case of the short lines, the appropriate role for the State to play in encouraging economic development around rail investment needs to be guided by a comprehensive strategic policy. In addition, the State may need to play an advocacy role on behalf of communities to ensure that railroad investment brings with it appropriate mitigation of noise, emissions, safety, and delay impacts.

What Are the State's Key Policy Questions?

The Washington State Transportation Commission and the consultant team have identified a set of key policy questions that must be answered to address the legislative mandate and State concerns:

- What are the freight-rail infrastructure and service needs of the State?
 - Who are freight-rail users and service providers?
 - What do users need from the system? What do service providers need from the system?
- What are the passenger rail infrastructure and service needs of the State?
 - Who are passenger rail users and service providers?
 - What do the users need from the system? What do the service providers need from the system?
- What are the key infrastructure, operational and institutional obstacles to meeting the State's rail needs?
- What is the State's role and interest in the rail system, and under what powers and authorities does it operate to accomplish this?
 - What is the State's role/interest in improving passenger and freight mobility?
 - What is the State's role/interest in ensuring state and regional economic competitiveness, including international trade functions?
 - What is the State's role/interest in ensuring cost-effective transportation options for key economic sectors?

- What is the State's role/interest in minimizing environmental, safety, and community disruption impacts of rail?
 - What are the State's existing powers and authorities with respect to rail?
 - How have state investments/actions to date supported these interests?
- What should the State's policies be for participation and ownership in rail infrastructure and service delivery, rail planning, and rail governance structures?
- What should policies be with respect to ownership/management of assets and delivery of services?
 - How should the State determine when and when not to invest in rail?
 - What should policies be with respect to other forms of financial assistance?
 - What policies should the State adopt to ensure protection of community interests?
 - What should policies be with respect to supporting economic development through rail investment?
 - What should policies be with respect to advocacy on behalf of Washington State rail shippers, ports, and communities?
 - What should the policies be with respect to rail planning?
 - What should the policies be with respect to the governance structure for rail programs?
- What are the key elements of a statewide rail asset management plan?

As the study progresses, it will be focused on providing answers to these questions.

1.3 THE STUDY

What Is the Study Process?

The study addresses these concerns and policy questions in the following three phases of work:

1. The first phase of the study assesses the state of the system today and how it is likely to respond to future demands. The study looks at the major elements of the system and their condition, the users of the system and future demand, the capacity of the system today and the major bottlenecks, and current public and private sector plans to address deficiencies and future demand. It is intended to define the issues and opportunities that state rail policy should address and portray what the results of inaction might be. This interim report is the product of the first phase work.

2. The second phase of the study will develop a formal rationale for state intervention in the rail system that is based on a clear understanding of economic costs and benefits and allocation of costs and benefits between the public and private sectors and different public and private parties. The consultant team will develop an analytical methodology that can be used to evaluate policies, projects, and programs against this rationale. The team also will look at approaches adopted by other states. This phase will develop policy options for dealing with issues and opportunities identified in the first phase, and the analytical approach for determining if packages of investments and programs can cost-effectively support the different policy options. The product will be the second interim report summarizing the key findings and conclusions.
3. The third phase of the study will apply the analytical methodology and policy rationale to develop a state rail policy, investment plans to address capacity needs, and a strategic asset management plan. The product of the third phase will be a final report summarizing the key findings, conclusions, and recommendations of the study.

The study will be informed along the way through an active public involvement process that will provide opportunities for public and expert comment on the study findings and conclusions as they are developed.

What Is the Purpose of This Interim Report?

This first interim report summarizes the findings and conclusions of the first phase of work examining the state of the rail system, its critical problems and bottlenecks, and current plans. The report provides a foundation for development of policy packages in subsequent phases. It is essentially a description of how the system is functioning now and how it is likely to function in the future in the absence of additional state action. Not all of the problems identified in this report should or can be solved by government intervention, but an effective set of strategic policies must proceed from an understanding of the roles and likely actions of all key stakeholders, public and private, local or global. In subsequent phases, the consultant team will define policies that could lead to changes in the way the system will function in the future and that will satisfy state economic and transportation goals and objectives. In order to evaluate how effective these policies will be, it is critical to understand how and why the system functions as it does in with the current government programs.

2.0 Overview of the Washington Rail System: Network, Users, and Carriers

2.1 THE WASHINGTON FREIGHT-RAIL NETWORK

What Is the Washington State Rail Network?

The Washington State rail network comprises mainlines, branch lines, industrial spurs and leads, and rail yards and terminals operated by a variety of public and private rail carriers. The rail network and sections owned by the individual public and private railroads are shown in Figure 2.1.

There are 23 freight railroads in Washington State. These include 2 large Class I railroads, 2 Class II regional railroads, and 16 Class III short line and specialized terminal and switching railroads.¹

The two Class I railroads operating in the State are the Burlington Northern Santa Fe Railway (BNSF) and the Union Pacific Railroad (UPRR). The Class II regional railroads are the Palouse River and Coulee City Railroad, which operates in the eastern portion of the State, providing service to several industries (most significantly, grain shippers), and operating over a combination of privately- and publicly-owned track; and the Montana Rail Link, which offers limited service in Washington State, reaching Spokane over trackage rights on the BNSF. The 16 active short lines and terminal/switching railroads in the State provide collector/distributor services for the larger railroads and local rail service to Washington State shippers and receivers. Table 2.1 lists the Washington State railroads, three of which are inactive.

¹ Railroad classification is determined by the Surface Transportation Board. In 2004, a Class I railroad was defined as having \$289.4 million or more in operating revenues. A Class II railroad, often referred to as a regional railroad, was defined as a non-Class I line-haul railroad operating 350 miles or more with operating revenues of at least \$40 million. Class III railroads, or short lines, are the remaining non-Class I or II line-haul railroad. A switching or terminal railroad is a railroad engaged primarily in switching and/or terminal services for other railroads (i.e., they are not typically involved in line-haul moves between two geographical locations).

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Figure 2.1 Washington State Rail Network

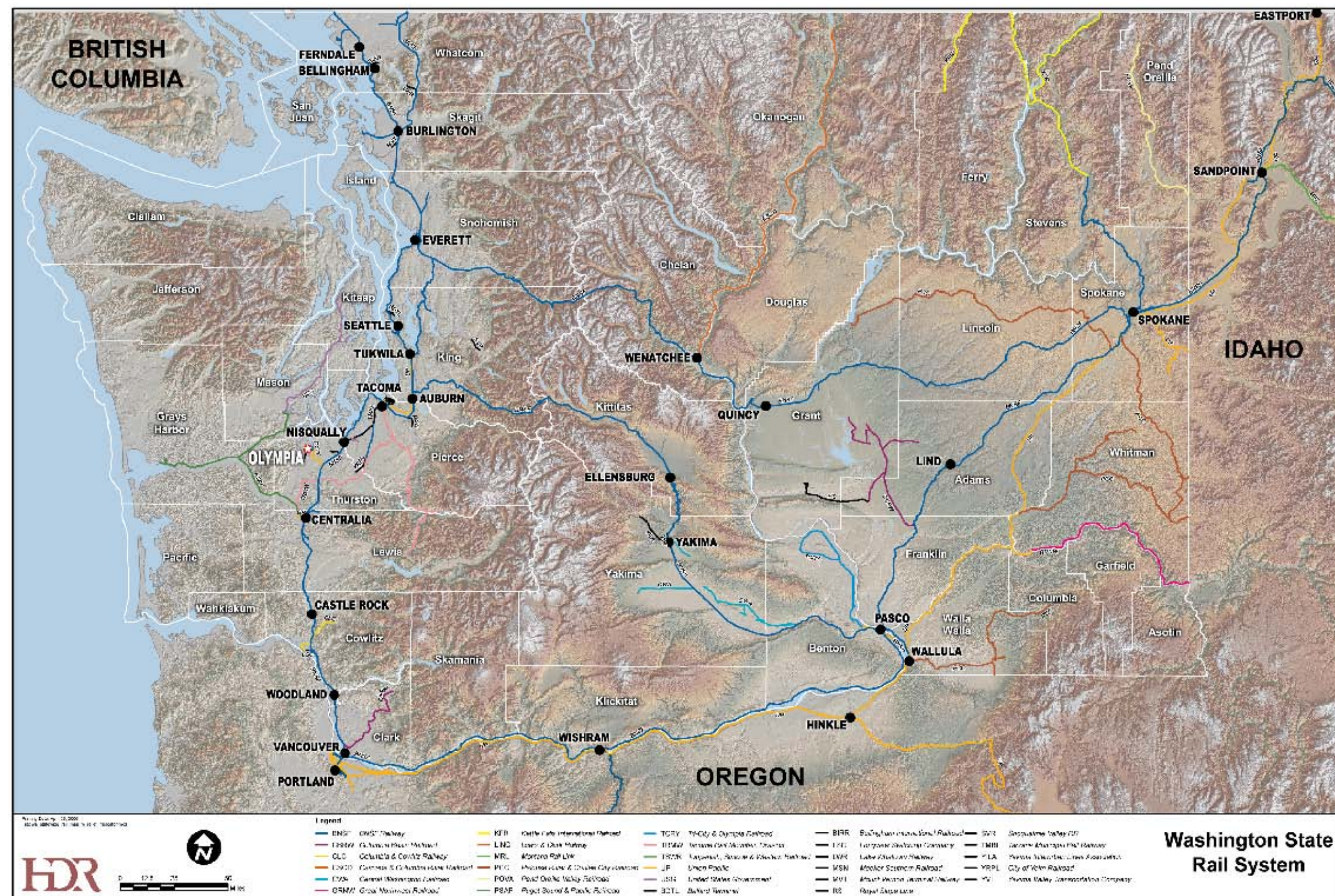


Table 2.1 Washington State Freight Railroads by Class

Name	Abbrev	Class I	Class II	Class III	Terminal/ Switching
BNSF Railway	BNSF	X			
Union Pacific Railroad	UPRR	X			
Montana Rail Link	MRL		X		
Palouse River & Coulee City RR	PCC		X		
Cascade & Columbia River RR	CSCD			X	
Central Washington State Railroad	CWA			X	
Columbia & Cowlitz Railway	CLC			X	
Columbia Basin Railroad	CBRW			X	
Great Northwest Railroad	GRNW			X	
Kettle Falls International RW	KFR			X	
Pend Oreille Valley Railroad	POVA			X	
Puget Sound & Pacific Railroad	PSAP			X	
Royal Slope Line (inactive)	RS			X	
Tacoma Rail Mountain Division	TRMW			X	
United States Government	n/a			X	
Yakima Interurban Lines(inactive)	YILA			X	
Yelm-Roy Prairie Line (inactive)	YRPL			X	
Tacoma Municipal Belt Line	TMBL				X
Tri-City & Olympia Railroad	TCRY				X

Source: Association of American Railroads (Freight Railroads Operating in Washington, 2004), HDR Inc.

The freight railroads operate 3,628 miles in the State over 2,523 miles of rail line. (Operated miles are greater than owned miles, because owning railroads lease operating rights over their lines to other railroads. And in a few areas, the U.S. DOT Surface Transportation Board, which has economic regulatory oversight of the railroads, has mandated provision of operating rights to ensure competition between railroads.) The BNSF owns and operates the most mileage in the State – 1,572 in-state-operated miles, constituting 5 percent of the BNSF’s total system mileage. Table 2.2 lists the mileage by railroad sorted from highest to lowest mileage. The table reports miles operated in Washington State (includes owned track plus trackage rights), percent of miles operated in Washington State to total miles operated, and the miles of road² owned in Washington State.

How Does the Washington State Rail Network Connect to the National Rail Network?

Figure 2.2 shows the national rail network. The BNSF and UPRR systems connect the Washington State rail network to this national rail network.

BNSF Railway

Figure 2.3 shows the BNSF national rail system. The BNSF east-west corridors connecting in Spokane provide two routes into the interior U.S. These routes provide connections to grain producers in the Midwest, as well as intermodal connections to Chicago.

² “Miles of road” is a linear measure of distance that does not consider the number of tracks.

Table 2.2 Summary of Railroad Miles in Washington State

Name	Abbrev	Miles Operated in WA³	Percent of Total Miles Operated	Miles Owned in WA
BNSF Railway	BNSF	1,572	5%	1,447
Union Pacific Railroad	UPRR	558	2%	280
Palouse River & Coulee City RR	PCC	370	90%	108
Puget Sound & Pacific Railroad	PSAP	178	100%	109
Kettle Falls International RW	KFR	142	88%	58
Cascade & Columbia River RR	CSCD	137	100%	131
Tacoma Rail Mountain Division	TRMW	132	100%	132
Columbia Basin Railroad	CBRW	112	100%	0
Great Northwest Railroad	GRNW	84	91%	69
Central Washington State Railroad	CWA	81	100%	21
Pend Oreille Valley Railroad	POVA	61	66%	61
Tri-City & Olympia Railroad	TCRY	56	100%	0
Tacoma Municipal Belt Line	TMBL	51*	100%	0
Royal Slope Line (inactive)	RS	26	100%	26
Longview Switching	LSC	17	100%	0
Montana Rail Link	MRL	16	2%	0
Yakima Interurban Lines(inactive)	YILA	11	100%	11
Columbia & Cowlitz Railway	CLC	9	100%	9
Meeker Southern Railroad	MSN	5	100%	5
Yelm-Roy Prairie Line (inactive)	YRPL	5	100%	5
Ballard Terminal Railroad	BDTL	3	100%	0
Mount Vernon Terminal RW	MVT	2	100%	2
United States Government	n/a	**	n/a	49
Total		3,628	n/a	2,523

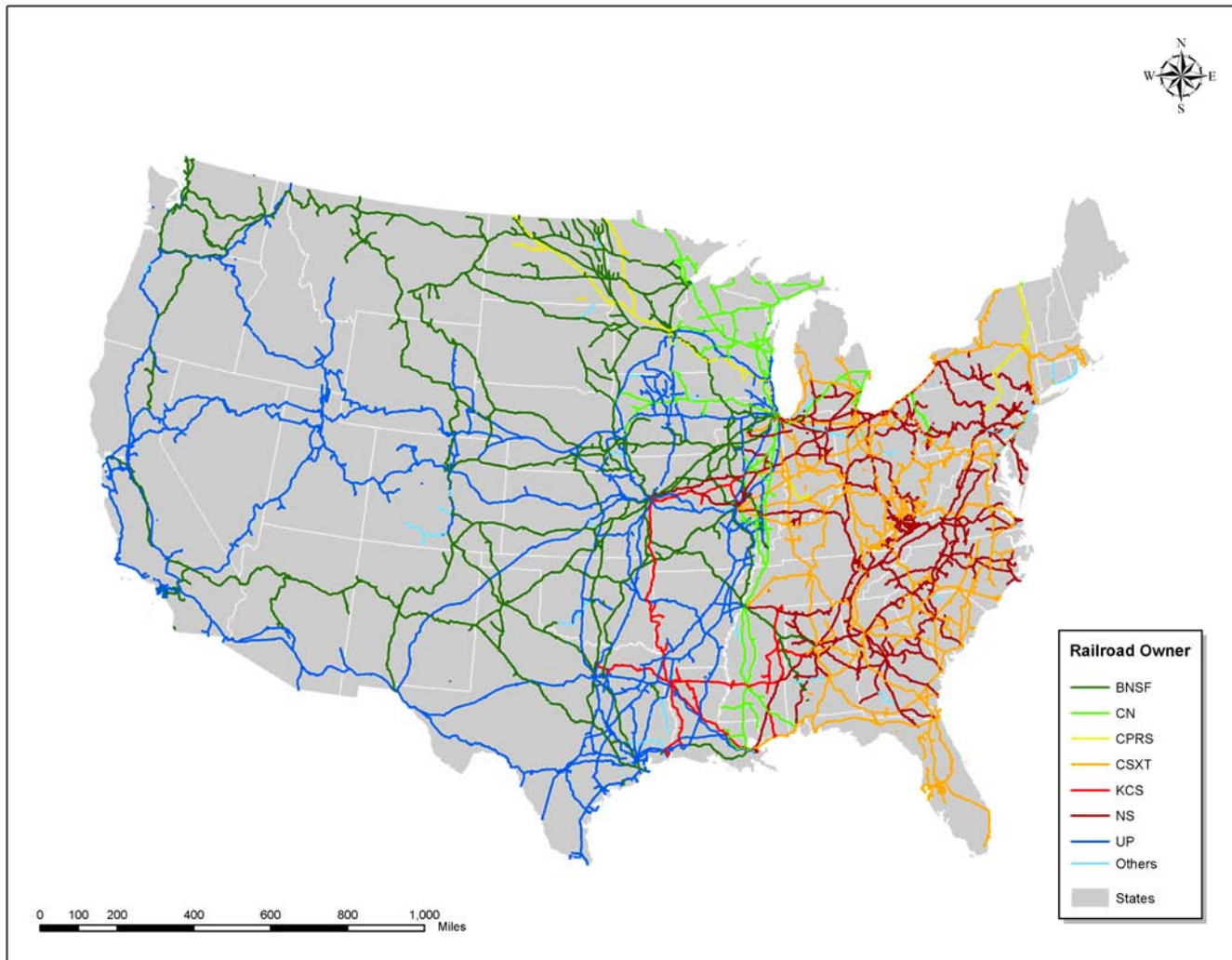
Source: Association of American Railroads (Freight Railroads Operating in Washington, 2004), HDR Inc.

*Does not include trackage within Port of Tacoma.

**Included in Puget Sound and Pacific Railroad-operated mileage.

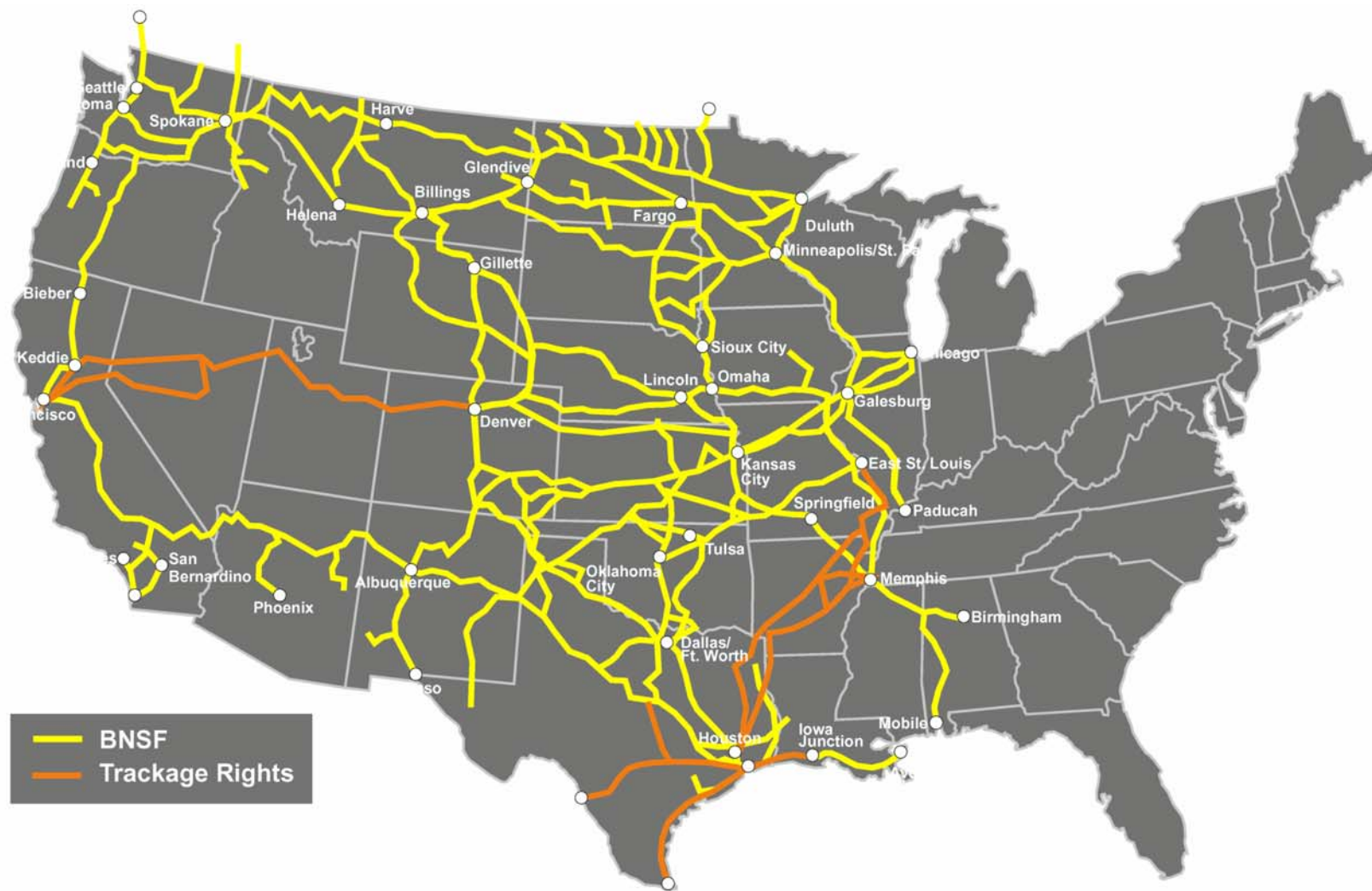
³ Miles operated includes all owned track plus trackage rights and leases.

Figure 2.2 National Rail Network



Source: BTS North American Transportation Atlas Data (NORTAD) CD.

Figure 2.3 Map of BNSF Railway National Rail System



The UPRR operates key north/south corridors, with several connections at the Mexican and Canadian borders.⁴ Figure 2.4 shows the UPRR national rail system.

East-west connections to the Pacific Northwest in the UPRR system feed into the UPRR's Central Corridor, which ultimately connects with the UPRR's lines coming out of the Powder River Basin coal fields. This is the most heavily trafficked section of the UPRR system, and capacity constraints can impact traffic movements in the Pacific Northwest. The Pacific Northwest connections to the Central Corridor have the highest traffic density of any of the lines that feed this corridor, providing a major connection between Columbia River ports and the grain producing regions of the Midwest. The north-south lines provide a major conduit for forest products from Washington, Oregon, and Canada down to the growing population centers of the Southwestern U.S.

What Are the Primary Rail Corridors and Terminals in Washington State?

BNSF Rail Corridors

BNSF provides service over seven major corridors and nine low-density corridors in Washington State. The major corridors are the primary conduits to the North American rail network, while the low-density corridors offer collection/distribution services. These corridors are listed in Table 2.3.⁵

The BNSF Washington State network provides three primary east-west routes out of the Pacific Northwest, all feeding ultimately through Spokane and onto Idaho. These include the Seattle to Spokane mainline (through Wenatchee), the Seattle to Portland/Portland to Pasco/Pasco to Spokane route, and the Auburn to Pasco/Pasco to Spokane route.

BNSF also provides connections into Canada with the primary high-density corridor traveling between Everett and Vancouver, British Columbia. Additional low-density branch lines provide service to numerous industrial customers.

⁴ Introductory material adapted from www.up.com.

⁵ See Technical Memorandum 1.1.A, *Washington State's Freight Rail System*, for additional detail on these corridors.

Figure 2.4 UPRR National Rail System

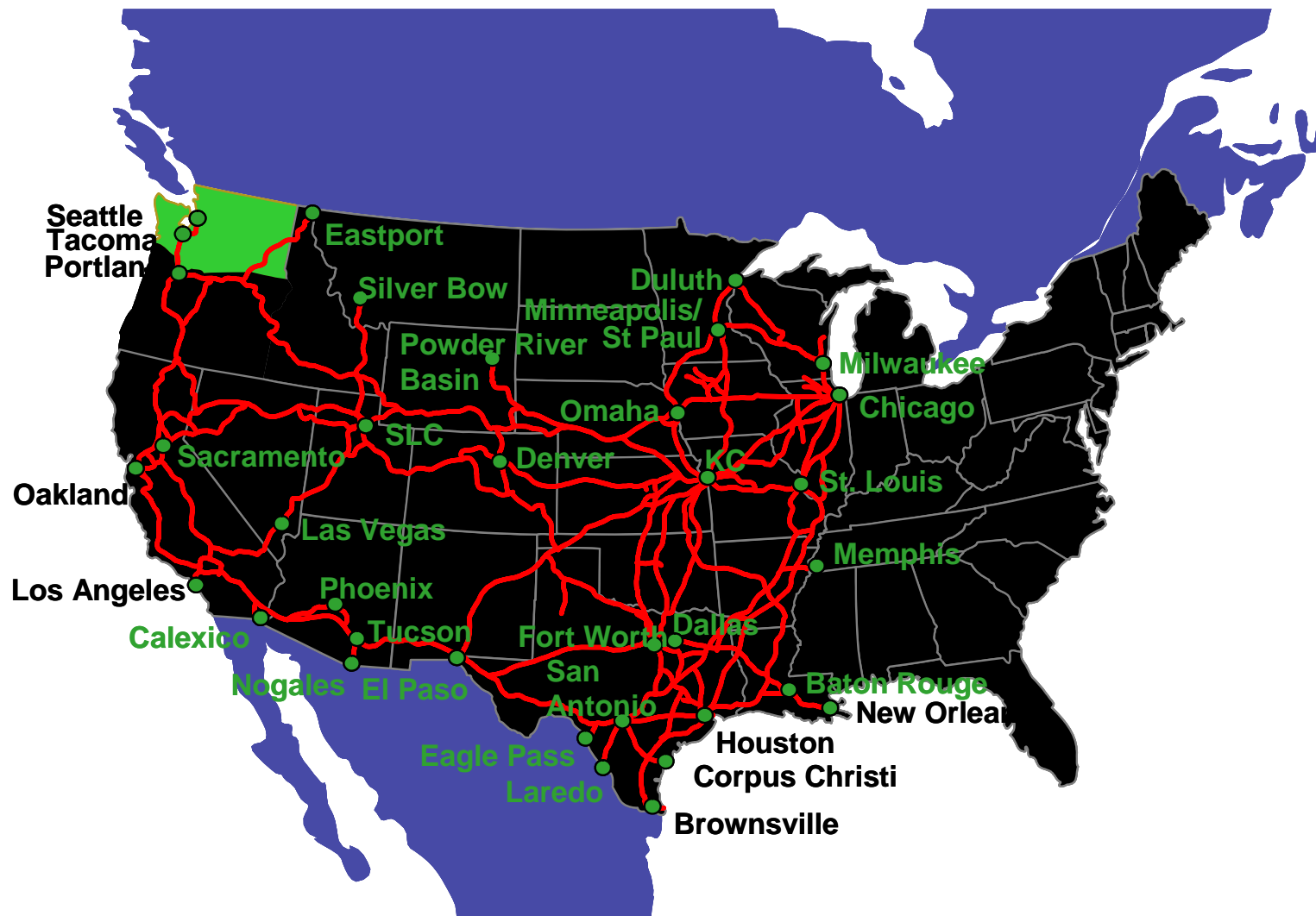


Table 2.3 List of BNSF Railway Service Corridors in Washington State

Major Corridors	Low-Density Corridors
Seattle – Spokane	Tukwila – Snohomish
Seattle – Portland	Woodinville – Redmond
Portland – Pasco	Burlington – Sumas
Auburn – Pasco	Sumas – Lynden
Pasco – Spokane	Burlington – Anacortes
Spokane – Sandpoint, ID	Intalco – Cherry Point
Everett – Vancouver, BC	Marysville – Arlington
	Lakeview – Roy
	Spokane – Chewelah

The first of these routes crosses through Stevens Pass and has been BNSF's primary route for intermodal traffic. The second route runs north-south between Seattle and Portland, and then along the Columbia River from Vancouver, Washington State, to Pasco, Washington State. This is the primary route for grain export trains inbound to the Columbia River ports, but due to heavy traffic through Stevens Pass, this has become a reliever route for intermodal traffic moving from Seattle and Tacoma to Vancouver, Washington State, and then east along the river. This route also connects with the Oregon Trunk Line in Wishram and provides the primary north-south connection for BNSF into California. The third route, the Auburn to Pasco route, crosses the mountains at Stampede Pass and had been previously abandoned by BNSF. However, the railroad began operations again on this route as capacity became tighter on its other east-west routes. Height restrictions through the tunnel at Stampede Pass do not allow for double-stack intermodal operations, limiting the immediate benefits of this reopened route.

Union Pacific Railroad

UPRR provides service over two major corridors and three low-density corridors in Washington State. The major corridors provide the primary conduits to the UPRR nationwide rail network, while the low-density corridors offer collection/distribution services within Washington State. These corridors are listed in Table 2.4.⁶

⁶ See Technical Memorandum 1.1.A, *Washington State's Freight Rail System*, for additional detail on these corridors.

Table 2.4 List of Union Pacific Railroad Service Corridors in Washington State

Major Corridors	Low-Density Corridors
Hinkle – Spokane	Spokane – Plummer, ID & Manito – Fairfield
Spokane – Sandpoint, ID	Ayer Jct. – Riparia
	Wallula – Kennewick

UPRR's primary east-west corridor serving traffic in and out of Washington State is in Oregon, running between Hinkle and Portland on the south side of the Columbia River. This is a primary grain route from the Midwest to the Columbia River ports. The line crosses to the north side of the Columbia River at Vancouver, Washington State. North of Vancouver, Washington State, the UPRR has trackage rights over BNSF track to Tacoma and Seattle. This is UPRR's primary intermodal route connecting to the Ports of Seattle and Tacoma. However, capacity and operational issues on the shared track have made this a difficult corridor for the UPRR operations. The Hinkle to Spokane corridor provides a critical interchange with Canadian rail carriers through Eastport, and UPRR has seen continuing growth in grain traffic along this route. UPRR also provides service to industrial and agricultural carload shippers in Eastern Washington State through the four low-density corridors listed in the table.

Terminals

Terminals and yards serve many functions for the railroads. Terminals are locations such as intermodal yards and ports that originate and terminate traffic. They may (or may not) be owned and operated by the railroad. Yards are owned by the railroads and are used to build outbound trains, break down inbound trains, and classify inbound cars for assignment to outbound trains for through traffic. Yards can offer refueling, crew change, storage, and maintenance functions. Given these key roles in the rail network, a significant amount of rail system capacity is determined by the capacity of the terminals and yards that connect the mainline corridors. Table 2.5 lists the number of major terminals and yards in Washington State by owner.⁷

⁷ See Technical Memorandum 1.1.A for additional detail about the 29 major terminals and yards that have the most impact on Washington State railroad movements. The memorandum describes the owner, yard/terminal name, location, and function. Also described are terminals and yards located outside the boundaries of Washington State, but whose operations strongly influence rail movements within Washington State.

Table 2.5 Summary of Major Terminal and Yard Ownership*

Owner	Number
BNSF	13
Canadian National	1
Longview Switching Company	2
Port of Kalama	2
Port of Portland	1
Port of Seattle	1
Port of Tacoma	1
Portland Terminal Railroad	1
Tacoma Rail	1
UPRR	6

*Not a comprehensive inventory of terminals and yards.

2.2 WASHINGTON STATE RAIL NETWORK CAPACITY

What Is the Capacity of the Washington State Rail Network Today?

Figure 2.5 shows the current (2006) practical capacity condition of each of the major rail corridors in the Washington State network. Rail corridors exceeding practical capacity are shown in red. Rail corridors at or very near practical capacity are shown in blue. Rail corridors below practical capacity are shown in green.

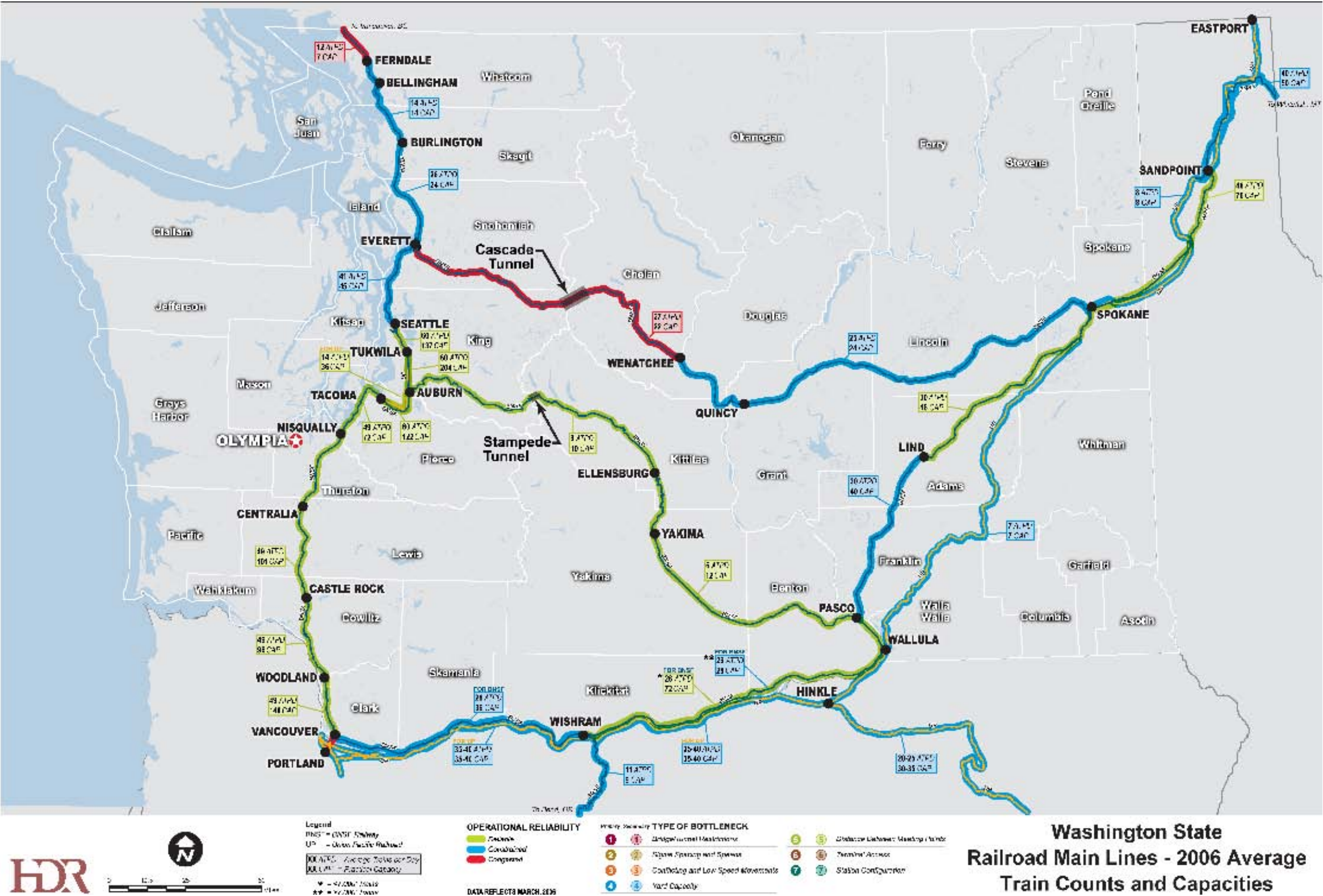
What Is Meant by Rail Capacity?

If a train leaves Chicago at noon traveling west at 50 mph and a train leaves Seattle at the same time traveling east at 50 mph, where will they meet? In the real world of railroading the answer is: “It depends.”

Rail capacity is the number of trains that can occupy a given segment of track over a given period of time. Determining “the number of trains” is a complex mix of science and art. In general, the science part of capacity depends upon the length and speed of the trains in addition to the characteristics of the physical railroad network. The railroad network includes main lines, sidings, terminals, rail yards, locomotive and car maintenance facilities, fueling facilities, signal systems, and communications infrastructure. All components of the network must be functioning perfectly and managed perfectly to achieve the “theoretical maximum rail capacity.”

The art of calculating the “practical rail capacity” is applying seemingly random factors such as human decisions, weather, equipment failures, imbalances between supply and demand for labor and equipment across the network, seasonal demands, spot commodity market prices, employee morale, and other factors to determine the realistic capacity of a given rail network. This capacity is termed the practical capacity.

Figure 2.5 Capacity Conditions of Major Washington State Rail Corridors, 2006



How Is Main Line Capacity Determined?

Main line capacity is calculated in a two-step process. The theoretical capacity of the line is calculated first, assuming perfect conditions and operations. The theoretical capacity represents the maximum density of trains that can operate over a given section of track at the highest speeds authorized.

The density or spacing of moving trains is termed dynamic track occupancy and is a function of the track infrastructure and signaling system. Rail signaling systems divide the track into sections or "blocks." Only one train can occupy a block of track at a time. Signals at the ends of the block tell the locomotive engineer if he can proceed into the next block. Signal spacing defines the dynamic track occupancy. The minimum distance between blocks is equal to the length of the longest train plus the required stopping distance for the heaviest train at the highest authorized speed plus a margin of safety. If the signals are spaced five miles apart, the maximum theoretical density is one train every five miles. The speed of the train and the spacing of the signals determine the minimum headway between trains that are moving at the normal speed for trains on the line. The minimum headway determines the theoretical capacity of the line.

Minimum headway is similar to traffic on a freeway, where all the vehicles are traveling at 70 mph and are spaced apart at exactly the safe following distance. In reality, a freeway may actually operate like this for a very short period of time over a very short distance before something happens that impacts this perfect distribution of speed and density. The system then breaks down and a traffic jam forms.

Practical capacity is the percentage of theoretical capacity that provides reliable service without significant delay and is estimated to be between 50 percent and 60 percent of the theoretical capacity. On a rail line operating at its practical capacity, minor disruptions can be absorbed with only temporary localized deterioration in performance. The overall rail network will continue to function in a predictable and reliable manner. This is similar to a freeway operating at a level of service of "C."

The system can continue to operate at levels up to 80 percent of the theoretical capacity, but any minor disruptions will result in severe disruptions to train operations systemwide. Operations over 80 percent of the theoretical capacity are not considered achievable, except for very short segments over short periods.

How Is Yard and Terminal Capacity Determined?

Rail yards and terminals serve as reservoirs for the main lines absorbing and redistributing railcars to their final destinations. A terminal is a geographically defined area that may consist of one or more yards. The capacity of the terminal is generally an aggregate of the capacity of the yards it encompasses. There are two aspects to the capacity of a terminal or yard:

1. **Static capacity** is the ability of a yard to accommodate standing equipment (i.e., cars that are stored, awaiting movement, or awaiting processing). It is related only to infrastructure. Static capacity is a simple measurement of the length of railroad cars against the trackage available for them. The static capacity may be broken into categories if portions of the yard trackage are designed for or assigned to a specific purpose. For example, if certain tracks are assigned to storage, classification, arriving trains, departing trains, repair, or trains that are stopping to set out or pick up, each has a separate capacity. These separate capacities form an aggregate capacity; however, the number of cars in each category cannot be exceeded regardless of the aggregate capacity and number of cars. The practical static capacity of a yard is considered to be between 60 percent and 80 percent of the theoretical static capacity. A yard must always have some open tracks available to receive, process, and dispatch cars.
2. **Dynamic capacity** is the ability of a yard to receive, process, and dispatch traffic, generally described in trains per hour for receiving and dispatching and cars per hour for switching. Static capacity is indirectly related to dynamic capacity. If traffic exceeds dynamic capacity, the number of cars in the yard may exceed static capacity. Dynamic capacity is dependent upon infrastructure, personnel, and equipment.

Classification yards have a special capacity limitation, the number of classifications into which cars must be sorted. For example, if a classification yard has five tracks, each with a capacity of 50 cars, the capacity is 50 cars for each of 5 destinations, not 250 cars. It is possible for 6 cars to exceed the capacity of the 5 tracks if each of the 6 has a separate destination (although this may be mitigated by the practice of double blocking [i.e., putting cars for more than 1 destination into each track and switching them again after the cars in 1 or more tracks have been removed from the classification yard for further movement on trains]).

Intermodal yards may also have a pavement capacity limitation (i.e., a limitation imposed by the pavement surface area available on which to drive vehicles, load or unload rail cars, or store trailers and containers).

What Factors Have the Greatest Effect on Rail Capacity?

Main Line Infrastructure

The limitation of capacity on a single track section of a railroad is the longest running time between sidings (or other tracks on which trains in opposite directions can meet). It may be further affected if there is also a need for a faster moving train to pass a slower train on the same section of railroad. As siding spacing is decreased and/or speed increases, capacity increases.

On a multiple track railroad, the limitation on capacity is the longest time that a train occupies a block. As signal block spacing decreases, capacity increases.

Yard Infrastructure

The number of operations that can occur simultaneously within a yard is directly related to the rail capacity of the yard and the main lines to which it is connected. For example, if switching must stop while a train is arriving or leaving a yard, those activities are limited by infrastructure. If the yard capacity to arrive and depart trains is less than the main line capacity, then the main line capacity is also constrained.

Speed

The capacity of a single track line can be increased by increased speed, both in main track operation and in entry and exit of sidings. An increase in speed on a multiple track line can increase capacity; however, it must be accompanied by a signal system design that will allow the increase to occur safely.

Signals

If there is a great speed differential among trains, signal system design can affect capacity. On a line that has heavy bulk commodity trains operating at 45 mph, light intermodal trains at 60 mph, and passenger trains at 79 mph, a signal system designed only for the stopping distance of the bulk commodity trains may unnecessarily increase the headways between trains. Signal system design can incorporate the difference in a number of ways. For example, instead of a series of three signals, the first indicating stop, the second indicating a reduce speed or a stop at the next signal, and the third indicating proceed at normal speed, the series might be more closely spaced signals indicating stop, proceed at 30 mph, proceed at 45 mph, proceed at 60 mph, proceed at normal speed.

The compensation for variation of speed limit is only effective when the speed limit affects all traffic. When the speed differential involves trains entering or leaving a route at a speed substantially less than the speed of through traffic, the speed differential cannot be compensated. In these situations, speed differential results in capacity loss.

Personnel

Insufficient personnel can affect dynamic capacity. For example, if a yard has several receiving tracks, one team of car inspectors, and the ability to switch

inspected inbound trains faster than they can be inspected, the capacity is limited by the lack of car inspectors.

Equipment

Equipment affects dynamic capacity when there is sufficient infrastructure to support simultaneous activities, but insufficient equipment. If the design of the yard permits two engines to switch cars simultaneously, but only one engine is available, the capacity is limited by equipment. This limitation also extends to the operation of trains between terminals. If the cars are available, made up, and ready to leave as a train, but there are no locomotives available, capacity is limited by equipment.

Traffic Demand

Traffic demand requirements are a non-technical aspect of capacity. When capacity is described in terms of trains per day, the figure may include periods during which there is little traffic demand. A line with a capacity of 50 trains per day may be inadequate for commuter operations, if the capacity available for commuter trains is at 3:00 a.m. Similarly, capacity at that time is of little value to a priority intermodal train that must leave at 3:00 p.m. to reach Chicago before the close of business 4 days later.

Track Maintenance

Track and signal maintenance are also a consumer of railroad capacity. If track and signals are not adequately maintained, speed restrictions may be imposed, diminishing capacity. When track or signal maintenance requires exclusive occupancy of a section of track, the capacity of the track is zero. On busy rail lines, maintenance windows are very limited and often require maintenance blitzes where the line is shut down for a period of days to replace worn out rail and ties.

Grade Crossings

Road crossings at grade can have an effect on capacity by limiting the ability of trains to stop at key locations. For example, at Tokio on the Pasco-Spokane route, the siding can accommodate a train 8,100 feet long, but Klein Road crosses the tracks 3,802 feet from the east end of the siding. Thus, a train cannot stop and wait for a passing train legally for more than 10 minutes (or less if so directed by law enforcement or emergency services personnel).

How Was Rail Capacity Measured for This Study?

Capacity may be measured by analytical methods (hand calculation) or by simulation modeling. The capacity of a complex arrangement of rail lines and terminals is difficult to calculate, requiring careful dissection of the subject rail line and terminals into segments of similar capacity.

Simulation models may be used for capacity evaluation; however, detailed rail simulation modeling is not within the scope of this study. The capacity numbers

presented in this report were compiled from previous studies and other readily available information, some simple calculations, and discussion with railroad operating personnel. The study team attempted to resolve discrepancies between conflicting capacity levels, where possible, using standard analytical methods.

Current typical running times (and/or roughly calculated running times) were used for determining corridor capacity based on continuous flow (east-west-east-west) on single-track lines. Train volumes are expressed as the practical capacity of the line, which is defined as 50 percent of theoretical capacity.

In order to establish a uniform basis for comparison, the discussion of practical capacity of the network does not include the effects of overtaking, which can vary widely depending upon the number of overtakes and the way in which the traffic is managed.

In some cases, the typical daily train volumes exceed the practical capacity. As a result, trains operating over these track segments experience a relatively high amount of congestion and delay.

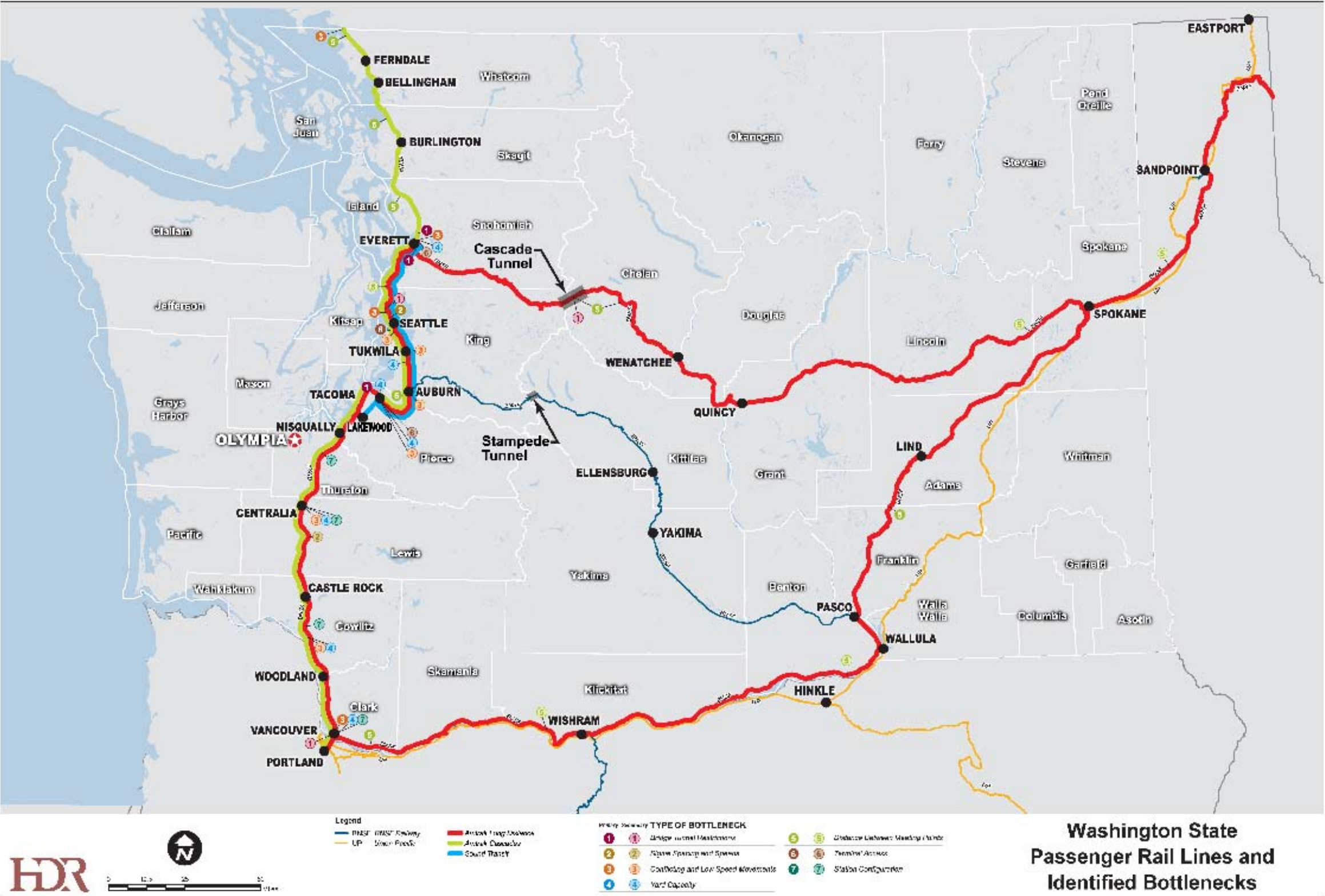
What Are and Where Are the Major Bottlenecks in the Washington State Rail Network?

Figure 2.6 shows the locations of the major bottlenecks in the Washington State rail network. Bottlenecks are restrictions in the system that cause a reduction in capacity over a particular segment or at a particular location. Seven types of bottlenecks are mapped:

1. Bridge and tunnel restrictions bottlenecks;
2. Signal spacing and speed bottlenecks;
3. Conflicting and low-speed movement bottlenecks;
4. Yard capacity bottlenecks;
5. Distance between meeting points bottlenecks;
6. Terminal access bottlenecks; and
7. Station configuration bottlenecks.

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Figure 2.6 Major Bottlenecks in Washington State Rail Network



Primary bottlenecks are indicated by white numeral in a dark-colored circle (e.g., ❶); secondary bottlenecks are indicated by colored numeral in a light-colored circle (e.g., ②). These bottlenecks are described in more detail in the appendix of this report from the perspectives of the various rail system users, who must deal with the service problems created by the bottlenecks. A primary bottleneck causes a significant reduction in capacity of a segment of the system or throughput of one of the system components (such as yards and terminals). These bottlenecks tend to be determining factors in a line segment's overall capacity. Given current mainline capacity and train volumes, a primary bottleneck will not necessarily create a congestion condition such that the line segment is considered overcapacity today. However, in light of traffic growth projections and the impacts that these primary bottlenecks have in reducing capacity, fixing the bottleneck is still important because the improvements will create a significant bump up in capacity of the line.

There are a larger number of primary bottlenecks in the north-south corridor than there are in the east-west corridors. This is primarily due to complexity of operations (more potential for conflicting movements), terminal and yard access issues in relatively concentrated areas, and speed-related issues that are often encountered in more urbanized areas. Some of the primary bottlenecks include:

- Siding issues and movements in and out of customs inspection facilities at and approaching the Canadian border;
- Siding spacing throughout the line segment between Bellingham and Everett;
- A variety of bottlenecks in and around Delta Yard in Everett, including speed restrictions across the Snohomish Bridge, single track in the Everett tunnel with multiple trains sharing this track, and speed restrictions through Delta Yard;
- Numerous terminal access issues in and around the Port of Seattle, conflicting and low-speed movements in and out of Interbay Terminal and accessing the grain terminals, and signal spacing and single track at Ballard;
- Numerous terminal access issues at the Port of Tacoma and restrictions and the Nelson Bennett Tunnel at Point Defiance;
- Conflicting and low-speed movements in and out of the Port of Vancouver and low speed to access the mainline; and
- Siding spacing issues on all of the east-west corridors.

2.3 FREIGHT-RAIL COMMODITIES

What Commodities Move Over the Washington State Rail Network?

By tonnage, the top commodities moved over the Washington State rail network in 2004 were:

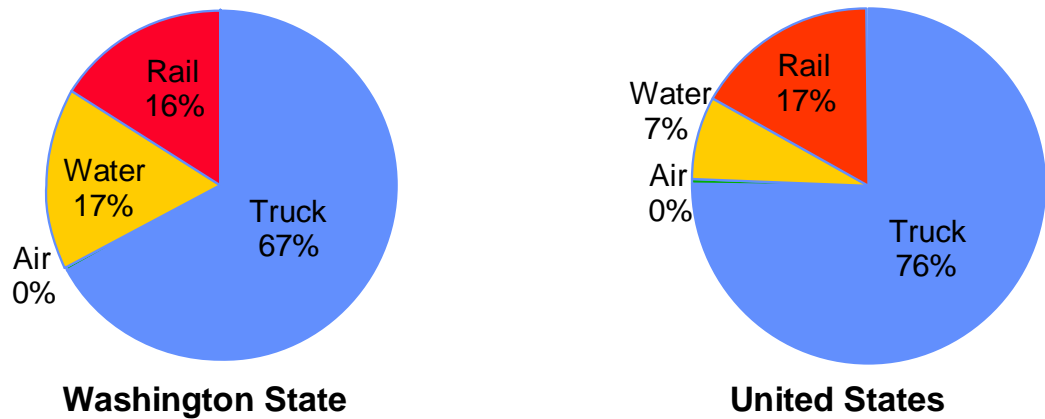
- Farm products (including grain shipped in hoppers cars and other farm products typically shipped in boxcars) accounted for 24 million short tons of freight moved over the Washington State rail network in 2004. More than 90 percent of this traffic terminated at Washington State ports for export to overseas destinations.
- Merchandise and other trade goods (classified as “miscellaneous mixed shipments,” and typically shipped in intermodal trailers and containers on rail-road flatcars) accounted for 10.6 million tons. In 2004, 60 percent of intermodal traffic was outbound from Washington State, much of it Asian imports arriving through the Puget Sound ports.
- Lumber and wood products (typically shipped using a mix of boxcars, flatcars, and containers) accounted for 5.3 million tons.

Other high-tonnage commodities were coal, waste and scrap, pulp and paper, transportation equipment, metal products, and chemicals.⁸

In 2004, Washington State’s freight railroads moved a total of 81 million domestic tons of freight, up from 63 million in 1996. This was 16 percent of all freight tonnage moved in Washington State by all freight-transportation modes. Trucks moved 67 percent of all tonnage; and water, 17 percent. Figure 2.7 shows the relative shares of freight tonnage carried by each the modes compared to the U.S. as a whole. Rail in Washington State carried about the same share as in the U.S. as a whole, but water moved a larger share, and trucks a correspondingly smaller share, than in the rest of the U.S. Grain, moved by barge from central and eastern Washington State to the Columbia River ports, accounts for the high share of the tonnage carried by water transport.

⁸ See Technical Memorandum 1.2.A, *Washington State Rail Traffic*, for additional details.

Figure 2.7 Washington State and National Freight Tonnage by Mode, 2004



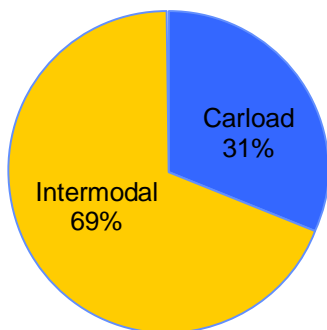
Source: Global Insight, based on 2004 STB Carload Waybill Sample data.

Farm products accounted for most of the tonnage moved by freight rail in Washington State; but by number of railcars, the top commodity moved over the Washington State rail network in 2004 was merchandise in intermodal containers. While a typical farm product or industrial carload shipment weighs between 80 and 110 tons, intermodal loads seldom exceed 20 tons and are often lighter. As a result, merchandise traffic requires many more railcar units and trains than grain, lumber, and industrial commodities hauled in hoppers, boxcars, and tankers. In addition, there is a considerable volume of empty containers headed back to Pacific Coast ports from the interior of the U.S., for which the railroads are compensated and, therefore, appear as rail traffic in the national databases.

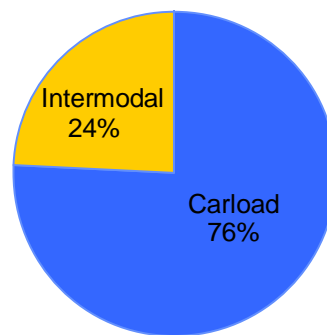
In 2004, intermodal containers accounted for more than 1.5 million railcar units moved on Washington State's freight network, while carload traffic such as grain and lumber required only 680,000 railcar units. In percentages, intermodal merchandise shipments accounted for 69 percent of total units, and all other commodities accounted for 31 percent. By tonnage, the pattern is reversed; carload commodities dwarfed intermodal by tonnage in 2004, accounting for 61.5 million tons or 76 percent of all tonnage, while intermodal accounted for 19.7 million tons or 24 percent. The differences in shares by units and by tonnage are illustrated in Figure 2.8.

Figure 2.8 Carload and Intermodal Traffic by Units and by Tonnage, 2004

2004 Carload/Intermodal Units



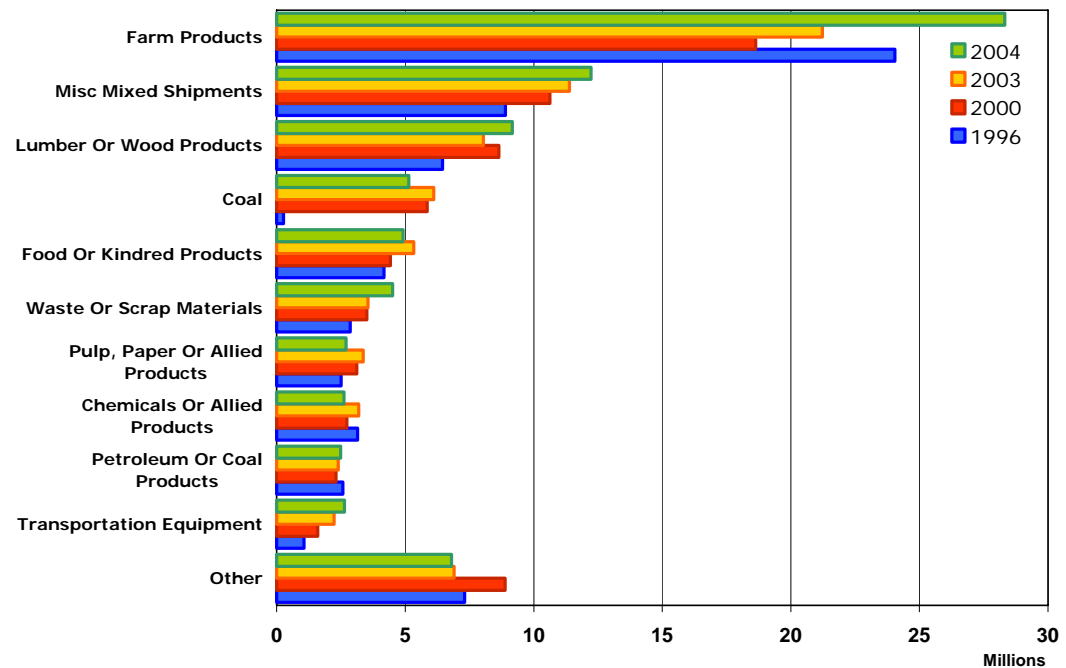
2004 Carload/Intermodal Tons



Source: Global Insight, based on 2004 STB Carload Waybill Sample data.

Figure 2.9 charts the shifts in tonnage of the top 10 commodities moved over the Washington State rail networks for the years 1996, 2000, 2003, and 2004. The commodity categories are based on the two-digit Standard Transportation Commodity Codes (STCC) used by the railroads and U.S. DOT for reporting freight-rail movements. “Miscellaneous mixed shipments” are merchandise and other manufactured products moving in trailers and containers on flatcars. The tonnage of farm products has fluctuated the most, responding to changes in world commodity markets, as well as crop and harvest conditions. The tonnages of pulp, paper, chemicals, and petroleum have shown relatively little growth over the last decade.

Figure 2.9 Washington State Rail Tonnage by Commodity for the Years 1996, 2000, 2003, and 2004



Source: Global Insight, based on STB Carload Waybill Sample data.

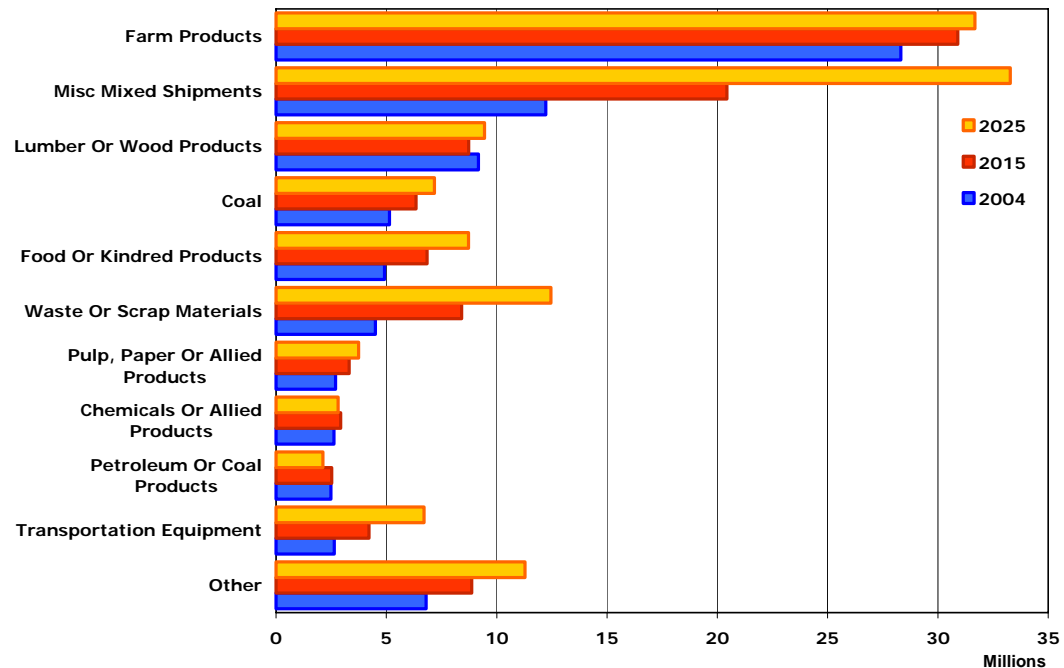
What Commodities Will Move Over the Rail Network in the Future?

The total freight tonnage moved over the Washington State rail network will increase by 59 percent between 2004 and 2025. Freight tonnage is forecast to grow at a 2.2 percent compound annual growth rate between 2004 and 2025. In 2015, the railroad will move 103.5 million tons compared to 81.5 million domestic tons of freight in 2004. In 2025, they will move 129.5 million tons.⁹

Figure 2.10 charts the tonnage of the top 10 commodities that will move over the Washington State rail network in the years 2015 and 2025. In 2015, farm products and intermodal merchandise (miscellaneous mixed shipments) will be the dominant rail freight commodities by tonnage, followed by lumber and wood products, waste and scrap, and “other” commodities. However, this pattern will shift by 2025, with intermodal merchandise becoming the number one commodity by tonnage (as well as by railcar units). The tonnage of intermodal merchandise will increase from 12.2 million tons in 2004 to 30.9 million in 2015, and to 31.7 million in 2025. This is a 4.9 percent compound annual growth rate between 2004 and 2025.

⁹ See Technical Memorandum 1.2.A, *Washington State Rail Traffic*, for a description of the forecasting methods and additional details on the commodity forecasts.

Figure 2.10 Washington State Rail Tonnage, by Commodity, 2004, and Forecast Tonnage, 2015 and 2025



Source: Global Insight, based on STB Carload Waybill Sample data.

The forecasts do not take into account the capacity of the rail system to absorb these increases. The forecasts reflect population and economic growth, structural changes in the economy, and international trade patterns. If the economy produces more commodities in the future that travel by rail today, then those commodities are assumed to travel by rail in the future. Conversely, if the economy produces more commodities in the future that travel by truck today, then those commodities are assumed to travel by truck in the future. Given current capacity constraint in the system, this forecast growth in rail traffic presents a challenge for the Washington State rail system.

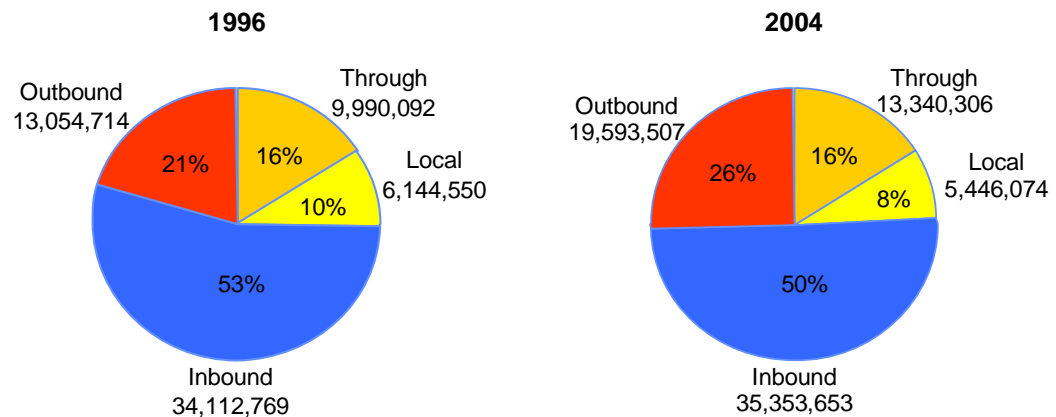
What Are the Rail-Freight Flows?

In 1996, 53 percent of rail tonnage was inbound to Washington State (shipments originating outside the State and terminating inside the State); 12 percent was outbound (shipments originating within the State and terminating outside); 16 percent was through traffic (shipments both originating and terminating outside the State); and 10 percent was local or intrastate traffic (shipments both originating and terminating within the State).

In 2004, inbound tonnage had dropped to 50 percent, outbound and through traffic had increased significantly, and local traffic had dropped. Inbound tonnage grew from 34.1 million tons in 1996 to 35.4 million tons in 2004, but lost share because outbound traffic grew from 13 million tons in 1996 to 19.5 million tons in 2004, reflecting the rapid growth of imported Pacific Rim merchandise.

Through-traffic tonnage increased from about 10 million tons to 13.3 million tons, reflecting the import of Canadian lumber and wood products to feed the growing U.S. housing markets in Southern California and the Southwest. Local traffic dropped in both tonnage and share. Figure 2.11 shows the change in shares and tonnage.

Figure 2.11 Washington State Rail Flows by Direction and Tonnage, 1996 and 2004



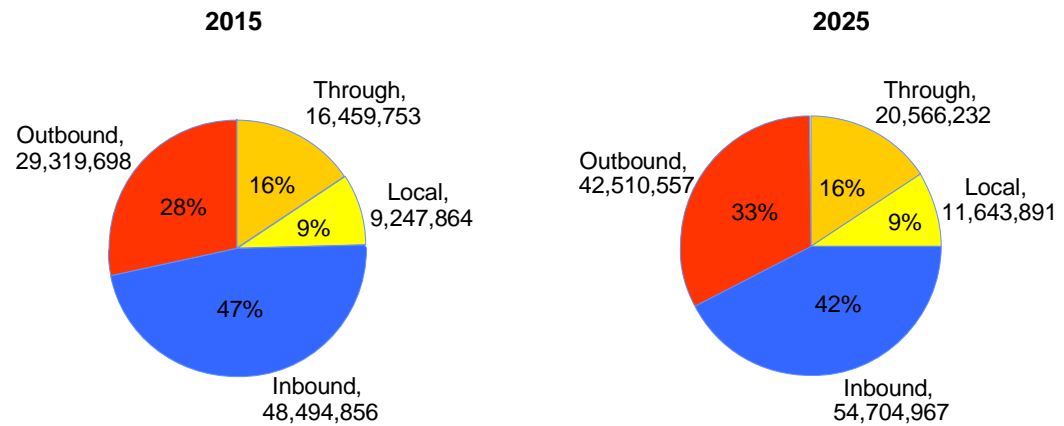
Source: Global Insight, based on STB Carload Waybill Sample data.

These shares will change significantly by 2015 and 2025. Outbound tonnage will grow from 19.5 million tons in 2004 to 29.3 million in 2015, and then to 42.5 million in 2025. By 2025, outbound tonnage, most of it intermodal traffic, will make up 33 percent of all rail tonnage moving over the Washington State network. Through traffic will hold steady at 16 percent; local traffic will grow modestly to 9 percent; but inbound traffic will shrink to 42 percent even though inbound tonnage will increase from 34.1 million tons in 2004 to 54.7 million tons in 2025. Figure 2.12 shows the changes in shares and tonnage.

Figure 2.13 shows the anticipated increases in outbound tonnage by destination region. Merchandise and other manufactured goods moving in intermodal containers to the rail hubs in Chicago for distribution by rail and truck to Midwest and East Coast markets will dominate the eastbound flows over the Washington State rail network by 2025.¹⁰ Outbound shipment of merchandise to Oregon will also increase. The Portland region is a major warehousing and distribution center for the Pacific Northwest. A portion of the intermodal container traffic imported through the Ports of Seattle and Tacoma is railed to Portland, trucked to distribution centers there, and then repackaged and trucked to stores and businesses across the Pacific Northwest.

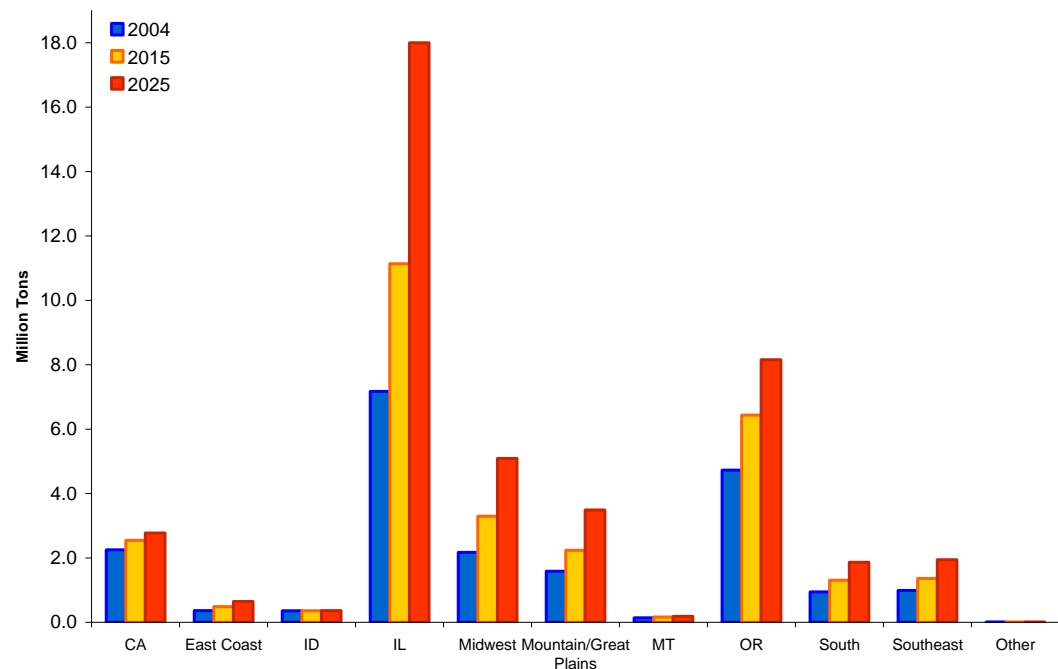
¹⁰See Technical Memorandum 1.2.A, *Washington State Rail Traffic*, for similar data and charts for inbound and through traffic.

Figure 2.12 Washington State Rail Flows by Direction and Tonnage, 2015 and 2025



Source: Global Insight, based on STB Carload Waybill Sample data.

Figure 2.13 Rail Tonnage Outbound from Washington State by Termination Region, 2004, 2015, and 2025



Source: Global Insight, based on STB Carload Waybill Sample data.

The impact on the rail network of the increase in intermodal flows can be seen by comparing the maps in Figures 2.14 and 2.15. The maps show the density of Washington State intermodal traffic flowing over the national rail network in 2004 and the forecast density of intermodal traffic in 2025. The wider the

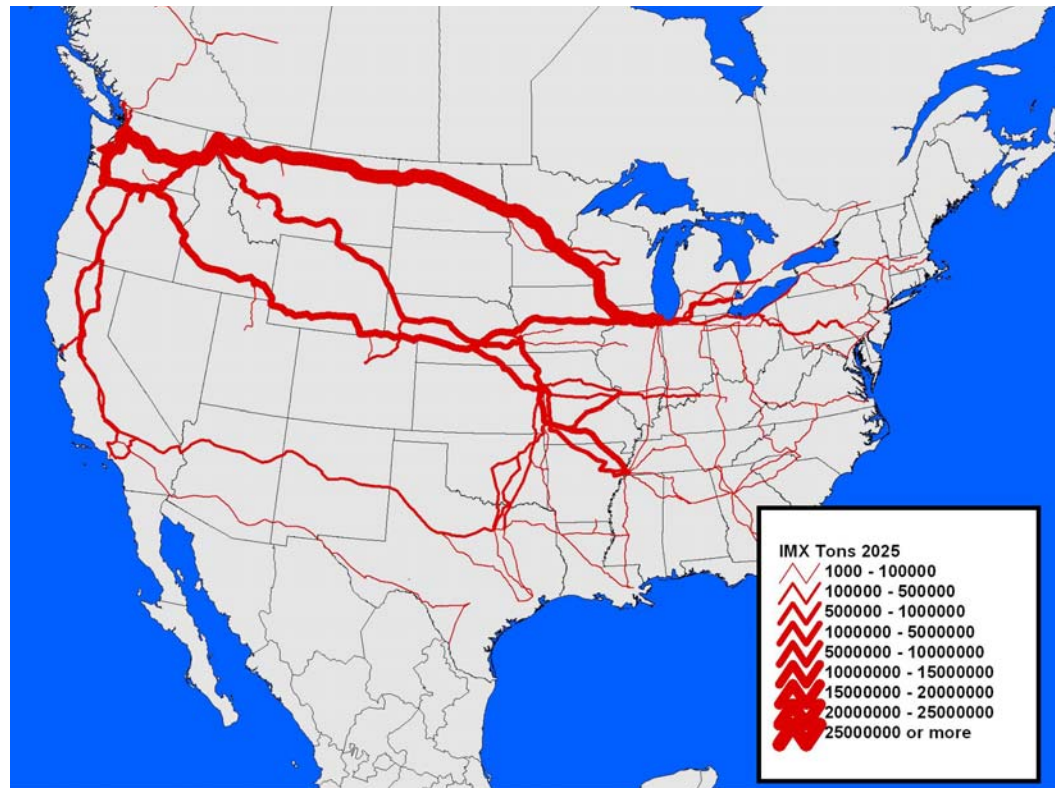
bandwidth, the greater the tonnage of freight flowing over the rail corridors. The assignment of the intermodal rail flows in this forecast is not constrained by capacity. The maps show the preferred route for these freight movements; the actual routes may be somewhat different. The question of whether and how the rail network can accommodate the forecast increases will be addressed in the second phase of work.

Figure 2.14 Intermodal Freight Flows in Tons, 2004



Source: Global Insight, based on 2004 TRANSEARCH freight flow data.

Figure 2.15 Intermodal Freight Flows in Tons, 2025



Source: Global Insight, based on economic growth forecasts and TRANSEARCH freight flow data.

2.4 RAIL USERS

Who Ships and Receives These Commodities?

The four major industry sectors that account for the vast majority of freight shipped and received over the Washington State rail network are:

1. Merchandise trade and retail industries, which use the rail system primarily to import merchandise and consumer products from Asia.
2. Manufacturing and industrial products industries, which use rail to move primary manufactured products, chemicals, coal, petroleum products, etc. between Washington State and U.S. and North America Free Trade Agreement (NAFTA) markets.
3. Agriculture and food products industries, which use the rail system to export grain, farm products, and processed food products to U.S. and global markets. This category covers two industries: producers of farm products, and producers of processed food products.

4. Lumber and wood products industries, which use rail to ship lumber and building products to U.S. markets, especially to Southern California and Southwestern markets.

As noted previously, in the case of merchandise commodity traffic and farm products, the majority of the rail traffic on the Washington State rail system is coming from or going to other states. The benefits of rail access to Washington State businesses has historically been most pronounced for the Eastern Washington State agricultural industry, the lumber and wood products industry, and certain manufacturing industries (transportation equipment, chemicals, and certain primary manufactured products). International trade traffic on the Washington State rail system also benefits the State through the Gross State Product (GSP) contribution of the transportation and wholesale trade sectors of the economy, which provide direct transportation services and logistics and product distribution services. In considering the importance of rail to the Washington State economy, it is important to look at the economic outlook for these sectors in Washington State and to determine how rail service affects their competitiveness.

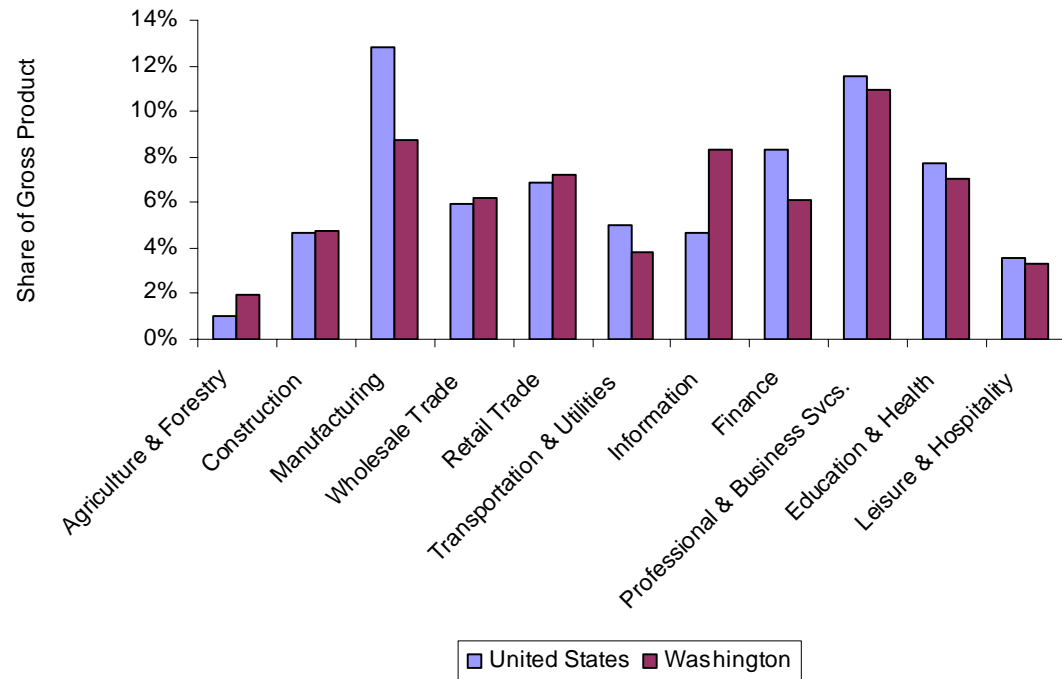
How Important Are These Industries to the Washington State Economy?

In 2004, Washington State's GSP totaled \$262 billion and generated 2.8 million jobs.¹¹ The four freight-rail intensive industries accounted for nearly 31 percent of the State's GSP and 35 percent of the jobs. Of the four, the largest contributor to the State's GSP was the merchandise trade and retail industry sector at \$45 billion¹², followed by manufacturing at \$23 billion. Figure 2.16 shows the contribution of all major sectors to Washington State's GSP as compared to the national industries to the United States economy. Table 2.6 provides a breakout of four freight-rail intensive industries' contributions to the Washington State's GSP in 1997 and 2004.

¹¹Economic and employment data from the U.S. Bureau of Economic Analysis.

¹²Much of the State's output in merchandise and retail trade is associated with local consumer products sales through retail outlets. Movement of consumer products to local retailers, when it is import-based and coming through the ports, generally moves by truck rather than rail. However, good rail access to the ports ensures that the ports remain economically competitive and, thus, receive good service from ocean carriers and regional consumer goods distribution facilities. This benefits the local merchandise trade and retail sector.

Figure 2.16 Washington State's Economic Structure Compared to the Nation's State Has Particular Concentrations in Information, Agriculture and Forestry, and Trade



Source: Bureau of Economic Analysis.

Table 2.6 Contribution to Washington State GSP of Freight-Rail Intensive Industries (in Billion Dollars)

Gross State Product by Industry	1997	2004
Merchandise Trade and Retail	\$33.5	\$44.9
Manufacturing	\$19.5	\$23.0
Agriculture and Food	\$7.2	\$7.4
Lumber and Wood Products	\$5.4	\$6.5
Total	\$65.6	\$81.8
Total as a Percentage of Washington State GSP	36.8%	31.3%

Sources: Bureau of Economic Analysis and U.S. Census Bureau.

While the contribution of all four industries to the Washington State economy has grown over the last decade, only the merchandise trade and retail industries sector has generated a significant number of new jobs, adding about 63,000 new jobs over the period. The agriculture and food products industry added only 8,000 jobs; and both the manufacturing and lumber and wood products shed jobs. Table 2.7 shows employment by industry in 1995 and 2005.

Table 2.7 Contribution to Washington State Employment of Freight-Rail Intensive Industries

Employment by Industry	1995	2005
Merchandise Trade and Retail	468,400	531,700
Manufacturing	311,300	272,000
Agriculture and Food	111,598	119,981
Lumber and Wood Products	45,400	37,700
Total	936,698	961,381
Total as a Percentage of Washington State Jobs	39.9%	34.6%

Sources: Bureau of Labor Statistics, Bureau of Economic Analysis.

What Is the Economic Outlook for Washington State's Freight-Rail Intensive Industries?

The current long-term population and economic forecasts predict that Washington State will be among the fastest growing states over the next decades. Population is expected to increase faster than the national average. Washington State had a population of 6.3 million in 2005, surpassing Indiana to become the 14th largest state in the country. By 2030, Washington State is forecast to have 8.6 million people, adding more people than all but 7 other states.

The influx of population will drive moderate-to-high job growth. Global and national competition will favor job growth in industries such as information, finance, professional and business services, education, and health. Rail-intensive industries, such as agriculture, lumber and wood products, and manufacturing industries, will continue to grow, but their relative contribution to the State's GSP and employment will drop.

Tracing the projected sales and employment for each of the freight-rail intensive industries provides a more detailed picture of growth rates and the implications for freight-rail demand.¹³

Merchandise Trade and Retail Sector

The merchandise trade and retail industry has been one of the faster growing sectors in Washington State. This sector accounted for nearly 30 percent of total sales for the State in 2005, and sales have grown 4 percent annually since 2000. The growth rate is expected to ease, but still come in at a strong 3 percent per year over the next 5 years and at a 3 percent compound annual growth rate over the forecast period, reflecting the strong population growth forecast for the State.

¹³See the appendix for additional information on each of the industries.

However, merchandise trade and retail industry sector, which saw good job growth in the late 1990s, has experienced very little job growth since 2000 and the forecast projects little change. Employment in this sector grew only 0.3 percent annually from 2000 to 2005. It is expected that employment growth will average 0.2 percent per year over the entire forecast, adding only 16,000 workers by 2025.

Manufacturing Sector

Manufacturing companies in Washington State include industry leaders in electronic machinery, aerospace, and transportation equipment production. Total sales in this sector increased 1.6 percent annually between 2000 and 2005. Sales are projected to increase at 3 percent per year from 2005 to 2010 and at 3.1 percent over the forecast period. Output should reach more than \$142.8 billion in 2025. However, employment is expected to increase only modestly, at 0.2 percent annually to 2010. After that, employment will decrease by 0.5 percent annually, so that the sector will employ 188,000 workers in 2025, compared to 207,000 today.

Trucks carried 74 percent of all freight in this industry in 2004. Truck freight tonnage is projected to increase 2.4 percent per year. Carload rail service accounted for close to 96 percent of all rail shipments by this sector in 2004, and will increase at 1.8 percent annually from 2004 to 2025. Intermodal rail tonnage in this sector is expected to increase at 1.4 percent annually over the same period. Air freight, which accounts for a very small proportion of manufacturing industry tonnage, will grow the fastest, doubling its tonnage by 2025.

Agriculture and Food Processing Sector

Total sales (i.e., output, not GSP) in the Washington State agriculture and food processing sector grew at a 3.6 percent compound annual growth rate from 2000 to 2005; however, the outlook is for growth to ease to 0.7 percent per year in the next five years and to 0.2 percent annually from 2005 to 2025. Employment in this sector is expected to decrease over the entire forecast period. Employment in this sector declined 1.7 percent annually, from close to 130,000 jobs in 2000 to 119,000 jobs in 2005. Employment is projected to decline by 1.0 percent per year over the forecast period to just under 100,000 workers by 2025. The changes reflect forecasted increases in energy and water costs¹⁴, as well as increased competition from lower-wage and lower-cost South American agricultural producers.

¹⁴The economic forecasts by Global Insight included in this study assume continued limitations in water availability that do not reflect recent water rights agreements in the Pacific Northwest. This could have an important impact on agricultural yields and costs that would lead to a more positive growth outlook for this sector than is reflected in the reported forecasts.

It is anticipated that Washington State agricultural and food products producers will take advantage of bio-engineering and food processing technology to increase productivity and capture new markets with value-added products. However, an increasing share of this freight traffic will go to truck. Truckers hauled about 57 million tons or slightly more than 60 percent of all freight in 2004. Truck freight tonnage is forecast to grow 2.4 percent annually from 2004 to 2015 and 2.2 percent annually over the entire forecast period. Rail carload demand is expected to increase 1.2 percent per year to 2015 before easing to 0.7 percent per year growth from 2015 to 2025.

Lumber and Wood Products Sector

The lumber and wood products industry has experienced increased competition from Canada and other foreign producers, resulting in a 2.3 percent annual decrease in sales from 2000 to 2005. Sales are forecast to continue falling at a 3.6 percent compound annual growth rate from 2005 to 2010 and at 1.2 percent until 2025. Employment has fallen further than sales figures, and the outlook for jobs in this industry is for a faster decline. Employment decreased at 5.6 percent annually from 2000 to 2005 and is expected to drop at 3.9 percent annually, averaging a drop of 1.7 percent annually between 2005 and 2025. While sales in logging and lumber have been falling, sales in secondary forest products (i.e., doors, windows, and furniture) have shown improvement with moderate growth and employment gains.

Trucking carried 75 percent of all freight tonnage in this industry in 2004, but consistent with the shrinkage in the industry, trucking tonnage will decline 0.2 percent from 2004 to 2015 and 0.6 percent per year over the forecast period. Intermodal rail tonnage is also expected to decrease, falling at 4.1 percent annually to 2015 and at 3.6 percent annually over the entire forecast, losing more than one-half of its 2004 tonnage by 2025. Much of the decline in intermodal freight tonnage will be the result of freight shifting from intermodal to carload as the mix of products changes from primary to secondary wood products.

What Is the Business Environment for Shippers and Receivers?

The shifts in economic output and employment in Washington State's freight-intensive industries reflect broad structural changes within the U.S. economy created by global competition and technology. The most pronounced change has been a shift toward value-added production and services to take advantage of the U.S. economy's relative advantages in technology and workers' education levels and skills. This has meant rapid job growth in knowledge-based industries, but slower job growth in traditional manufacturing industries as automation replaces manual work, and export of finished products replaces export of raw lumber, farm products, etc. The second pronounced change has been strong reliance on lower-cost overseas suppliers for production of many goods.

Both trends have in part been enabled and accelerated by freight transportation. The economic deregulation of the rail, truck, water, and air freight transportation

industries in the 1980s triggered a massive restructuring of freight transportation firms and operations, lowering shipping prices and vastly improving the quality and reliability of freight shipments. Combined with innovations, such as containerization, computerization, and digital telecommunications, cheaper and better transportation has allowed shippers to source parts and products from Europe, Asia, and the Americas; to export high-value-added goods to world markets; and reduce inventory-carrying costs by making and shipping products on demand. The result is an economy in Washington State, as well as nationally and globally, that is very dependent on cost-effective and reliable long-distance transportation. Both trends – the shift toward value-added production and services, and the reliance on lower-cost overseas labor for production of consumer goods – are expected to continue and put more pressure on supply chains and the freight transportation system.

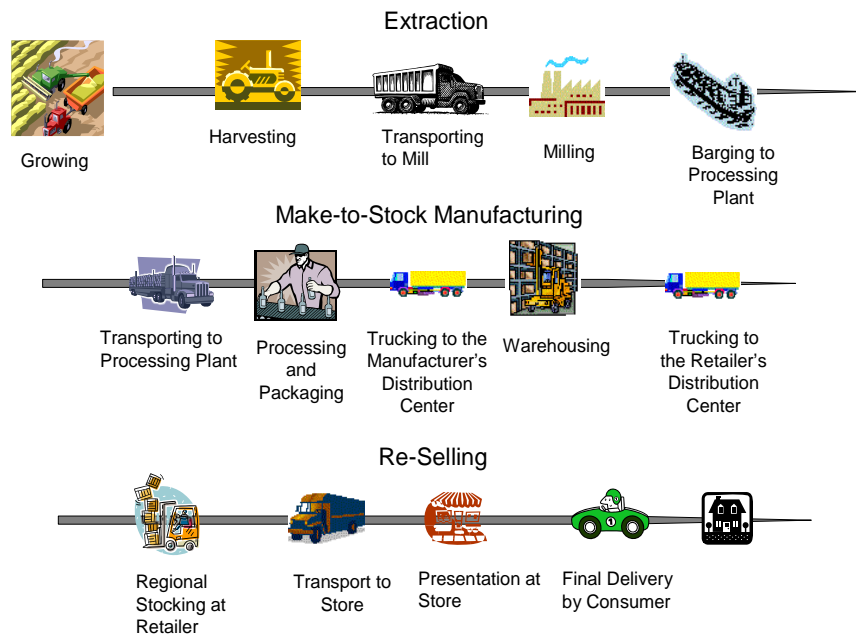
As illustrated in Figure 2.17, supply chains are a series of linked “source,” “make,” and “sell” transactions. The example in the figure traces the movement of grain to produce cereal. Production of cereal involves three broad categories of industries: extraction (agriculture), make-to-stock manufacturing (food product [cereal] manufacturing), and retailing (supermarket wholesaling and retailing). Figure 2.18 provides a highly simplified description of these industry types and their transportation needs.

To cut costs and improve product choice and availability, the companies in the supply chains closest to consumers – supermarkets and general merchandise retailers such as Wal*Mart – are pushing toward “just-in-time” or “time definite” operations. A supply chain that replenishes, right away, whatever the customer consumes is called an “on-demand” supply chain. Eliminating inventory and replenishing everything right away results in smaller shipment sizes – since units are consumed one by one – and more individual products (or SKUs) per shipment to make lot sizes more economical to ship. The effect of increased use of smaller shipment sizes is to pull the “extraction,” “process manufacturing,” and “make-to-stock” industries toward the supply-chain operation models of the “make-to-order,” “distribution,” and “re-selling” industries. The practical effect of this is that industries that once made heavy use of freight rail are today making more use of truck; and industries that once held large inventories of products and could tolerate delays in shipment and receipt of goods are now demanding great reliability and visibility from their freight carriers. The pressure to support on-demand, time-definite supply chain operations applies equally to global supply chains as to domestic supply chains. Increasingly, containerships sailing from Asia are scheduled to match West and East Coast port unloading slots, to meet transcontinental intermodal train schedules, to mesh with motor carrier delivery route schedules, and to make the “last mile” delivery to the customer on time.

Figure 2.17 Supply Chains: An Illustration

Supply chains are a series of linked “source,” “make,” and “sell” transactions. Supply chain analysis can trace transactions involving money, information, or physical goods as they move along the source-make-sell chain. The example below traces the movement of grain to produce cereal.

How Does Cereal Get to Your Pantry?



Source: David Jacoby, Boston Logistics Group.

Cereal, an ordinary, everyday product, is called a “fast-moving consumer good,” or FMCG for short, by supply chain experts. FMCGs follow a lengthy trail that spans three basic steps: extraction, make-to-stock manufacturing, and re-selling. In the extraction phase, the grain is farmed, transported to a mill, where it is ground, sifted, and sorted by grade. In the make-to-stock manufacturing phase, the milled grain is shipped to a processing plant, where it is mixed with other ingredients, baked, dried, and packaged. The manufacturer then ships it to the manufacturer's distribution center. In the re-selling phase, the manufacturer ships the packaged cereal to one of the retailer's regional distribution centers. The retailer then ships it to the store. You complete the supply chain by driving it home and placing it in your pantry.

Figure 2.18 Industry Supply Chain Types and Transportation Needs

Industry Supply Chain Types

Extraction Industry

- Allegheny Coal, Monsanto, FMC, Cargill, Mosaic... have few sites, use a lot of heavy equipment, and operate in commodity businesses
- Supply-chain needs: High-asset utilization and low-unit cost transportation

Process Manufacturing Industry

- BASF, Cabot, Air Products, DuPont, Gallo... have few sites, use a lot of specialized equipment, and operate continuous production facilities
- Supply-chain needs: Low-unit cost transportation and reliability of delivery (service)

Make-to-Stock Industry

- GM, CNH, GE Power Systems, Georgia Pacific Building Products... have many sites, lots of in and out product flows, and use as much labor as machinery and equipment
- Supply-chain needs: Reliability of delivery (service)

Make-to-Order Industry

- Boeing, Northrop Grumman, Bechtel, Raytheon... have few sites, limited in and out product flows, and are technologically advanced
- Supply-chain needs: Reliability of delivery (service) and speed of delivery (quality)

Distribution Industry

- Arrow Electronics, W.W. Grainger, Dresser, UPS... have many small nodes, lots of in and out product flows each in small quantities, and use a lot of vehicles
- Supply-chain needs: Reliability of delivery (service) and speed of delivery (quality)

Re-Selling Industry

- L.L. Bean, Dell, Gateway, Wal-Mart, Sears... have large number of ship-to points, lots of in and out product flows each in small quantities, and contract out freight to carriers
- Supply-chain needs: Transportation flexibility, agility, and ability to change product mix rapidly

Examples of Supply Chain Critical-Success Factors by Industry

Industry	High-Asset Utilization	Low-Unit Cost	Reliability of Delivery (Service)	Speed of Delivery (Quality)	Flexibility/Agility/Ability to Change Rapidly
Extraction	• Capacity Utilization	• Logistics Cost			
Process Mfg		• Inventory Cost			
Make-to-Stock Mfg		• Production Cost	• Fill Rate		
		• Packaging Cost	• Order Cycle Time		
			• Perfect Orders	• Transit Time	• NPI Cycle Time
Distribution					• Changeover Time
					• Time to Flex Up 20%

Source: David Jacoby, Boston Logistics Group.

What Do Shippers Need From the Freight Railroads?

In this changing business environment, are Washington State shippers and receivers getting appropriate and adequate freight-rail service? During the course of in-depth interviews across a broad range of Washington State shippers and receivers, the answers were consistent. The vast majority of the 30 rail-dependent shippers and 14 rail-dependent logistics service providers interviewed for this study complained that they do not receive the expected rail service value for the prices they pay. Shippers are concerned about rate hikes and declines in service quality, complaining frequently about the lack of equipment, both locomotives and specialized railcars. Smaller Washington State shippers, captive shippers (shippers served by only one railroad), and short line railroads are especially concerned about the Class I railroads' push toward transload centers and consolidation terminals.

The most frequently mentioned key performance indicators upon which shippers judge the performance of their rail carriers are adequate, timely and/or consistent equipment supply; consistent transit times; on-time performance; service interruption recovery time; rates; ability to respond to spot rate requests; service consistency; and dependability and frequency of switching. Among these criteria, the primary message that shippers and receivers delivered – irrespective of industry sector – was their need for sufficient equipment and reliable rail service at competitive prices.

Shippers and receivers reported that substandard rail service quality has a direct effect on the Washington State economy by driving up their operating costs, which are passed on to consumers. Because of geography and global trade routes, Washington shippers felt they are at a competitive disadvantage compared with shippers in other states as they try to compete in the global marketplace. Agriculture, forest products, and other commodity shippers find it especially tough to compete since other alternatives to freight rail are not always available due to the nature of the products. These shippers must work harder to keep their supply chains operating efficiently despite the lack of equipment, inconsistent and long transit times, and infrequent switching at their rail spurs.

2.5 INTERNATIONAL TRADE PORT/RAIL SYSTEM

What Are the Main Elements of Washington's Rail-Dependent International Trade Port System?

Washington State has an extensive network of public ports, but for the purpose of this section of the report, the focus is on those ports that handle most of the State's international trade traffic that has to be transported to or from the ports by rail. These are the Ports of Seattle and Tacoma (the primary container ports) and the Ports of Vancouver, Kalama, and Longview (the primary bulk and breakbulk commodity ports). Together, the Ports of Seattle and Tacoma handled 2.8 million twenty-foot equivalent units (TEU) of cargo in 2005, making them one

of the largest load centers for container trade in the U.S. (In 2004, they handled 17 percent of all the containers processed by the nation's Pacific ports.) Much of this cargo is destined for locations in the interior U.S. and most of this moves inland by intermodal rail. This is the fastest growing component of rail traffic on the Washington State rail system. The Ports of Vancouver, Kalama, and Longview handle large quantities of agricultural products, lumber and wood products, and other bulk commodities. Agricultural exports, coming mostly from the Midwest, are moved by rail to these Columbia River ports, and this commodity represents the largest tonnage amounts of cargo transported on the Washington State rail system today.

The main elements of the container trade system include the marine terminals, rail intermodal terminals (either on-dock or off-dock), rail access routes between the terminals and the rail mainlines, and the mainline system. The intermodal terminals serving the Port of Seattle include on-dock yards at Terminal 5 and Terminal 18, the BNSF's Seattle International Gateway (SIG), and the UPRR's Argo Yard. The Port of Tacoma has on-dock intermodal terminals serving each of their marine terminals. These include the North Intermodal Yard (NIM), South Intermodal Yard (SIM), Washington United Terminal (WUT), and the Pierce County Terminal (PCT). The Port of Tacoma is also currently developing plans for a new marine intermodal terminal along the east Blair waterway. The main intermodal mainline routes serving these ports are the BNSF primary intermodal route over Stevens Pass and their secondary route along the Columbia River Gorge; and the UPRR route south from Seattle/Tacoma to their Columbia River Gorge route.

The Ports of Vancouver, Kalama, Longview, Tacoma, and Seattle all have grain export elevators at the port facilities that are accessed by rail. The primary mainline routes for agricultural traffic on the Washington State rail system are along the Columbia River Gorge for both UPRR and BNSF.

What is the Significance of the International Trade Sector to the State and National Economy?

According to the Washington Public Ports Association, one in three jobs in Washington State depends on trade.¹⁵ A recent Study by the Port of Tacoma indicated that in 2004, 113,000 jobs in the State were connected to the Port and that the Port generated \$91 million in state tax revenue.¹⁶ The Port of Seattle, in its 2003 economic impact study, reported that the Port supported 34,501 jobs, resulting in \$2.1 billion in wages and salaries, and \$210.8 million in state and

¹⁵2004 WPPA Marine Cargo Forecast, prepared by BST Associates, May 2004.

¹⁶Port of Tacoma 2004 Economic Impact Study, Port of Tacoma, Tacoma, Washington, July 2005.

local taxes.¹⁷ The Port of Vancouver estimates that it produced 5,500 direct and indirect jobs in 2001 producing over \$242 million in wages and salaries, plus \$29 million in state and local taxes.¹⁸ Clearly, the value of these international trade assets to the State's economy is significant.

How Effectively Is Rail Meeting the Needs of the International Trade Port System?

There are serious capacity constraints and local access chokepoints in the international trade system that affect both container and bulk cargo movements. These are described in more detail in the discussion of rail bottlenecks in the appendix sections on Merchandise Trade and Retail, and Agricultural and Food Products sectors, respectively. With respect to container trade, both the Port of Seattle and the Port of Tacoma believe that through a combination of building out current facilities and improving productivity, their marine terminals could process more cargo than current forecasts suggest will be moving through these Ports over the next 20 years. In the case of Seattle, there are serious capacity issues at the rail intermodal facilities that represent constraints to future growth. The UPRR's Argo Yard is currently operating at capacity and the railroad has indicated that it may be forced to drop domestic intermodal service (A significant fraction of this cargo is actually international traffic that has been transloaded from international containers to domestic containers.). BNSF's SIG yard has access problems and is nearing capacity (although BNSF does have plans to expand capacity through new technology). The Port of Seattle's T-18 on-dock terminal is not efficient as an intermodal terminal, and the space is being used for container storage. The Port of Seattle also has several bottlenecks associated with accessing the mainlines from the terminals. The Port of Tacoma is in a better position because it has land with which to expand on-dock intermodal capacity and has plans to do that. There are some configuration issues that create capacity constraints as well as access problems. While there are a number of plans underway to address some of these access and terminal problems, a more serious concern is lack of east-west mainline capacity, particularly that which is cleared for double-stack operations. Problems with inadequate siding spacings along the Stevens Pass line have limited capacity and this is pushing more traffic into the Columbia River Gorge (which also suffers from inadequate siding spacing problems). This will be a dominant issue in the Washington State freight-rail system in the future because the fastest growing segment of rail traffic is international intermodal cargo. When the number of car units and trains generated by this cargo as opposed to focusing on tonnage, this segment of traffic will consume

¹⁷*The Economic Impacts of the Port of Seattle*, Martin Associates, Lancaster, Pennsylvania, September 2004.

¹⁸*The Economic Impacts of the Port of Vancouver*, Martin Associates, Lancaster, Pennsylvania, February 2001.

most of the available capacity in the system and will create shortages that need to be addressed. In the forecast horizon, if all of the improvements identified in the long-range passenger rail plan are not completed, it is also likely that there will be constrained capacity in the north-south corridor due to growth in international intermodal cargo. Predicting the exact requirement for capacity in each corridor is complicated by the relationship between north-south movements and east-west capacity and the operating plans of the BNSF.

The siding spacings in the Columbia River Gorge also restrict capacity for grain trains running along these lines into the Ports of Vancouver, Kalama, and Longview. There are also problems from local operations at the yards in each of these ports that impact capacity on the mainline system. Again, these problems are described in more detail in the appendix on the Agricultural and Food Products rail users.

What is the Outlook for International Trade and Washington State's Rail System?

The outlook for continued growth in international trade with the Pacific Rim is strong and so cargo volumes through the Washington State ports are expected to continue to see high rates of growth. By 2025, China will be the number one trade partner for Washington State, eclipsing Japan and South Korea. Measured in total tons of imports and exports moving by sea, China will represent a full third of total tonnage trade (imports and exports) with the Pacific Northwest. China will also represent a growing market for the export of Washington State products.

The Port of Seattle is expected to handle 3.7 million TEUs in international containers by 2025. The Port of Tacoma container volume is expected to grow from just over 1 million TEUs in 2004 to 2.7 million TEU by 2025. Intermodal rail shipments, which accounted for more than one-half of all freight demand in Washington State in 2004 and three times the amount shipped by rail using car-load services, are forecast to grow at a 7.2 percent compound annual growth rate from 2004 to 2015 and at a 5.8 percent compound annual growth rate over the forecast period.

What Do the Ports Need from the Rail System?

Continued growth in rail capacity for the container ports is critical to the forecast of volume, because the share of container trade handled through the ports that moves by rail is so high. Port rail service can be described as necessary, but not sufficient to realizing the forecast volumes (which are based on unconstrained demand not taking into account the effects of capacity shortages). Current forecasts for the Ports of Seattle and Tacoma were recently revised downward to 6.4 million TEUs by 2025 from earlier forecasts of 7.3 million. The very rapid growth in 2004 to 2005 container volumes at the ports represented a reaction to congestion problems elsewhere along the Pacific Coast, most noticeably in Southern California. But volumes are back up at the Ports of Los Angeles and

Long Beach and this represents at least a short-term market share threat to the Puget Sound ports. Looking forward, the Ports will face new competition from the Port of Vancouver, British Columbia, a new port being built at Prince Rupert specifically for North American inland container traffic, and new “all-water” services using and expanded Panama Canal.

The WPPA Rail Capacity Study¹⁹ indicates that the most serious mainline capacity issues facing the international trade rail system are the constraints on the east-west lines. In particular, constraints on the BNSF line over Stevens Pass are pushing more traffic onto the north-south corridor and the Columbia River Gorge and creating conflicts with other traffic on these lines. Terminal capacity issues at the Port of Seattle are a concern and, while there are several projects underway to address these issues, more may need to be done. Local access and egress problems at all of the ports described in this chapter will also need to be addressed. The biggest issues in the north-south corridor with impacts on mainline capacity include the single-track section through the Nelson Bennett Tunnel under Pt. Defiance and problems with local operations that spillover onto the mainline at Longview/Kalama and yard issues moving through Vancouver, Washington State.

2.6 FREIGHT RAILROADS

Who Are the Freight Railroads?

BNSF Railway

The BNSF is one of the four largest U.S. railroads (along with CSX Transportation, Norfolk Southern, and UPRR). It operates in 28 states and 2 Canadian provinces; has 32,000 route miles systemwide (1,621 in Washington State); and employs 40,000 people systemwide (3,125 in Washington State). The railroad has total assets of \$30.304 billion, and annual revenues of \$12.987 billion systemwide (\$752 million in Washington State). The BNSF dominates many markets in Washington State and the Pacific Northwest; its business strategy emphasizes intermodal traffic.

The BNSF network extends from Seattle, Washington to Birmingham, Alabama. East-west service is provided through connections with the eastern railroads at four major gateways (Chicago, St. Louis, Memphis, and New Orleans) and several minor interchange locations. North American service is provided through connections with Canadian and Mexican railroads.

BNSF moves more intermodal traffic than any other rail system in the world. In 2005, more than 5 million intermodal shipments (truck trailers or containers) were transported on BNSF’s rail lines instead of on the highways. According to

¹⁹WPPA Rail Capacity Study, MainLine Management and HDR Engineering, 2004.

the BNSF, the railroad is one of the largest grain-hauling railroads in the United States. In 2005, BNSF transported more than 900,000 carloads of agricultural commodities, nearly one-half of which were corn and wheat movements. Among the industrial products carried by BNSF's carload services are lumber, newsprint, printing paper, paperboard, propane, lube oil, motor oil, asphalt, canned beverages, coiled sheet steel, recycled iron and steel, cement, asphalt, the gypsum, crushed stone, limestone, iron ore, soda ash for glass, and kaolin clay for paper.²⁰

Union Pacific Railroad

UPRR is the largest railroad in North America, operating 32,400 route miles in the western United States. The railroad serves 23 states, linking every major West Coast and Gulf Coast port and provides service to the east through four major gateways (Chicago, St. Louis, Memphis, and New Orleans) with the eastern railroads. The UPRR has 19.1 million tons of freight originating or terminating in Washington State; its business strategy is to grow the carload market, while maintaining a strong intermodal product.

The railroad has one of the most diversified commodity mixes in the industry, including chemicals, coal, food and food products, forest products, grain and grain products, intermodal, metals and minerals, and automobiles and parts. Their largest customer is APL Limited, a steamship company that operates in the Pacific, and the second largest customer is General Motors.

Important commodities moved on the UPRR are chemicals, intermodal, and coal. UPRR is the nation's largest hauler of chemicals, much of which originates along the Gulf Coast near Houston, Texas. UPRR is also one of the largest intermodal carriers (containers and trailers). With access to the coal-rich Powder River Basin in Wyoming and coal fields in Illinois, Colorado, and Utah, the railroad moves more than 250 million tons of coal annually.²¹

Short Line Railroads

Railroads are classified based on revenues, size of operation, and type of operation. Regional and short line railroads fall into the following three categories (based on 2004 dollar values):

1. **Class II** – A non-Class I line-haul railroad operating 350 miles or more with operating revenues of at least \$40 million. Class II railroads are called regional railroads, though they are often classified with and referred to as short lines.
2. **Class III** – The remaining non-Class I or II railroads engaged in line-haul movement. Class III railroads are also known as short line railroads.

²⁰Introductory material adapted from www.bnsf.com.

²¹Introductory material adapted from www.up.com.

3. **Switching or terminal** – A railroad engaged primarily in switching and/or terminal services for other railroads (i.e., they are not typically involved in line-haul moves between two geographical locations). Switching and terminal railroads are often referred to as short line railroads, except in cases where they are owned by one or more Class I carriers.

Short line ownership can take many different forms:

- **Class I ownership** – Typically a jointly owned switching or terminal railroad, such as the Longview Switching Company at the Port of Longview, Washington.
- **Industry ownership** – Operated typically for one industry, but can provide service to other industries. The most popular owners are steel and paper companies. The Columbia & Cowlitz is owned by Weyerhaeuser.
- **Holding company ownership** – A railroad that is owned by a corporation holding several short lines. The two largest are Rail America currently with 47 short lines (owner of the Cascade & Columbia River, and the Puget Sound & Pacific) and the Genesee & Wyoming with 43 short lines. Similar to large chain stores forcing independent store owners of business, the trend in railroading is for the large holding companies to continue acquiring the independent short lines.
- **Public Ownership** – This includes state owned (e.g., part of the Palouse River & Coulee City), city/municipality owned (e.g., Tacoma Municipal Belt Line), Federally owned (typically for military purposes, such as the rail line at Ft. Lewis).
- **Independent Ownership** – The railroads that are independently owned and operated (e.g., the Mount Vernon Terminal).

A description of each of Washington State's active short line railroads is contained in Table 2.8.

Table 2.8 Short Line Railroads operating in Washington State

Railroad	Ownership – Year	Size – Service Area	Commodity Mix	Freight Volumes
Ballard Terminal RR	City of Seattle (operated by BTRR on a franchise agreement) – 1998	Seattle (3 miles from N.W. 40 th St to BNSF Mainline interchange at N.W. 67 th St)	Cement, frozen fish, furniture	170 (2001) carloads ¹ 52 (2000) 107 (1999) 121 (1998)
Cascade & Columbia River RR	RailAmerica – 1996	131 miles from Welch to Oroville	Forest, agricultural, minerals	6,298 cars (2003)
Central Washington RR (CWA)	Private (wholly owned subsidiary of Columbia Basin Railroad) – 2005	8.6 miles from Yakima to Moxee City 3 miles from Yakima to Fruitvale 30 miles from Gibbon to Granger 15.6 total miles of numerous short stretches of trackage between Grandview and Zillah 20.5 miles from Toppenish to White Swan	Agricultural, and chemical products	
Columbia & Cowlitz RR	Private (wholly owned subsidiary of Weyerhaeuser Company) – 1928	8.5 miles from Columbia Junction to Ostrander Junction in southwest WA. Interchange with BNSF and UPRR at Rocky Point, WA	Forest products, steel, paper, and chemicals	4 trips per weekday between Weyerhaeuser Mill and Rocky Point; 640 railcars per week; maximum 40 cars per train ²
Columbia Basin RR	Private – 1996	39.6 miles between Connell and Wheeler (interchange with BNSF at Connell) 12.5 miles between Bassett Junction and Schrag 13 miles between Warden and Othello 18 miles between Wheeler and Moses Lake	Agricultural (grain, cottonseed, sugar beets, fresh/frozen potatoes); Chemical (fertilizers, chemicals); and Paper (rolled paper, cardboard) products	8,400 carloads per year (63 carloads per year beyond McDonald siding); 6 days a week service between Connell and Wheeler ³
Great Northwest RR	Private (wholly-owned subsidiary of Watco Companies) – 2004	77 mainline miles from Lewiston, ID to Riparia, WA (crosses Washington State at Clarkston); Junction with UPRR and BNSF at Ayer west of Riparia, via UPRR trackage rights	Agricultural, Paper, Chemical, and Waste (scrap iron) products	
Kettle Falls International RW	Private (wholly owned subsidiary of OmniTRAX) – 2004	83 miles from Chewelah, WA to Columbia Gardens, BC (Canada); Interchange with BNSF at Chewelah 77 miles from Kettle Falls, WA to San Poil, WA via Grand Forks, BC (Canada)	Forest, Agricultural, Mineral, Lumber, Metal and Chemical products	18,769 carloads per year in 2005; 26 trains per week (6 days a week interchange operations with BNSF) ⁴
Longview Switching Company	Private (jointly owned subsidiary of BNSF and UP)	Terminal switching operations at the Port of Longview		

Table 2.8 Short Line Railroads operating in Washington State (continued)

Railroad	Ownership – Year	Size – Service Area	Commodity Mix	Freight Volumes
Meeker Southern RR	Private (wholly owned subsidiary of Ballard Terminal Railroad) – 2000	4.9 miles between Meeker Junction (Puyallup) and McMillin, WA (interchange with BNSF at Meeker)	Forest Products	Equivalent to around 1,125 heavy truckloads freight per year ⁵
Mount Vernon Terminal RW	Private (George and S. Stephenson) – 1933	1 mile of track in Mt. Vernon (interchange with BNSF at Mt. Vernon)	Chemical Products	16 fertilizer cars inbound from BNSF in 2005 40 tank cars of butane from BNSF (yard storage) in 2005 50 cars of used motor oil outbound to BNSF forecast for 2006 (no inbound traffic forecast for 2006) ⁶
Palouse River & Coulee City RR (PCC) (Cheney - Coulee City Line)	Private (wholly owned subsidiary of Watco Companies) – 1996	107.8 miles between Cheney and Coulee City (interchange with BNSF at Cheney)	Primarily Agricultural (wheat, lentil, barley), and Chemical (fertilizers) products; Small share of machinery, minerals, food and forest products	Close to a million tons of cargo per year on average; grain carloads in recent years ranging between 7,400 and 10,400 carloads per year ⁷ ; around 1,700 carloads in 2005 on “CW line” between Cheney and Coulee City ⁸
Palouse River & Coulee City RR (Wallula – Walla Walla, and Dayton – Walla Walla – Weston OR Line)	Private (wholly-owned subsidiary of Watco Companies) – 1998	99.7 miles between Wallula, Walla Walla, Dayton and Weston, OR (interchange with UP at Wallula)		
Palouse River & Coulee City RR (Hooper Junction – Thornton, Winona – Moscow ID, and Pullman – Marshall Line)	Public (WS DOT); Operated by PCC – 2004	Around 160 miles between Hooper Junction, Thornton, Marshall, and Moscow ID (interchange with BNSF at Marshall and UP at Hooper Junction)		
Pend Oreille Valley RR	Public (Port of Pend Oreille) – 1979	62 miles between Newport and Metaline Falls, WA; 25.6 miles between Newport and Dover, ID; interchange with BNSF at Sandpoint, ID; total 63 miles operated in Washington	Newsprint, Cement	
Puget Sound & Pacific RR (PSAP)	Private (wholly owned subsidiary of RailAmerica) – 1997	84 miles between Centralia and Hoquiam, WA (interchange with BNSF at Centralia, and UP at Blakeslee Junction, WA) 25 miles between Elma and Shelton Around 8 miles between Centralia and Chehalis	Forest, Agricultural, and Chemical Products	7,500 rail carloads in 1997; annual average traffic of around 14,000 carloads ⁹
Tacoma Municipal Belt Line – Tidelands Division	Public (City of Tacoma) – 1918	Operations on all the trackage in the Port of Tacoma terminal area	Containerized cargo, chemicals, automobiles, scrap metal, grain, frozen food, lime, petroleum and lumber products	118,537 units in 2005 (91,546 intermodal line hauls, 25,574 commercial line hauls, and 1,417 switches) ¹⁰

Table 2.8 Short Line Railroads operating in Washington State (continued)

Railroad	Ownership – Year	Size – Service Area	Commodity Mix	Freight Volumes
Tacoma Municipal Belt Line – Capital Division	Public (City of Tacoma) – 2004	Belmore - East Olympia Line: 16 miles between East Olympia and Belmore (interchange with BNSF at East Olympia) Quadlok Line: 3 miles between St. Claire and Quadlok Lakeview Line: 15 miles between Nisqually and South Tacoma	Lumber, bricks, cullet aluminum Pulp board Animal Feed, Plastic Pellets, Polyethylene, and Sand	
Tacoma Rail Mountain Division	Public (City of Tacoma) – 1998	132 miles between Tacoma – Morton, and Fredrickson – Chehalis (interchange with BNSF & UPRR at Tacoma, and BNSF, UPRR & PSAP at Centralia/Chehalis area)	Forest Products, Chemicals, and Airplane Components	3,092 units in 2005 (1,310 commercial line-hauls, and 1,782 switches) ¹¹
Tri-City & Olympia RR – TCRY (Richland – Hanford Site Line)	Public Line Ownership (Port of Benton); operated and maintained by TCRY – 2000	18 miles between Richland and U.S. Department of Energy's Hanford Site (interchange with UP at Richland)	Agricultural Products	
Tri-City & Olympia RR – TCRY (Olympia Line)	Public (Port of Olympia); operated by TCRY – 2002	Terminal switching operations on 2-miles of port-owned tracks between marine terminals and mainline tracks of BNSF and UP	Containerized cargo, Metals	5 train shipments per week outbound of Russian aluminum ingots ¹²
United States Government (Shelton – Bangor and Bremerton Lines)	Public; operated by PSAP	44 miles between Shelton and Bangor 4.6 miles between Bremerton Jct and Bremerton, WA	Special components for the U.S. Navy	
United States Government (Ft. Lewis)	Public	Track ownership within Ft. Lewis Military Reservation		

¹ South Ballard Transportation Corridor Study.² State Route 432 Route Development Plan (2001).³ Northern Columbia Basin Railroad Project Feasibility Study (February 2006).⁴ Interview with Rick Degman, Director, Marketing.⁵ WSDOT Rail Web Site.⁶ Interview with George Stephenson.⁷ *Purchase and Rehabilitation of Palouse River and Coulee City Railroad Track – Assessment of Economic and Community Benefits*, Report, May 2004.⁸ *Palouse River and Coulee City Railroad: CW Line Market Assessment*, Report, March 2006.⁹ Puget Sound Business Journal.¹⁰ Tacoma Rail Web Site (<http://www.tacomarail.com/home/aboutus.asp>).¹¹ Tacoma Rail Web Site (<http://www.tacomarail.com/home/aboutus.asp>).¹² Port of Olympia Web Site (<http://www.portolympia.com/whatnew/press/030513.htm>).

What Services Do the Freight Railroads Provide?

Bulk Unit Train

Bulk unit trains move very high volumes of a single commodity, such as coal, grain, minerals, and municipal solid waste. (Intermodal containers and specialized automobile carrier cars are frequently made up into unit trains; these are addressed in the discussion of intermodal service.) Commodity flows tend to be one-way; cars (usually hopper cars) move loaded from shipper to receiver and are returned empty from the receiver to the shipper. Commodity flows tend to be “door to door,” moving from shipper to receiver entirely by rail. Bulk unit train commodities are highly sensitive to transportation cost because they are heavy, but like coal and grain relatively low in value. Unit trains provide the efficiencies needed to move these commodities cost-effectively. This is accomplished through:

- Long trains (up to one and one-half miles) of rail cars moving along mainline corridors, which allows economies of scale in operation (less handling cost, more efficient utilization of locomotives, greater fuel efficiency, etc.);
- Uniform composition (usually a single commodity and railcar type), which simplifies the collection and distribution of railcars along feeder lines; and
- Customers who tend to produce or consume large quantities of these materials, reducing the number of origins and destinations that need to be served.

Mixed Carload

Mixed carload trains (also referred to as carload manifest) move a diverse range of commodities, including chemicals, food products, forest products, metals, auto parts, waste, and scrap. Rail carload equipment includes liquid-bulk tank cars, open flatcars, hopper cars, and traditional boxcars. (Intermodal containers and specialized automobile carrier cars can also be handled as carload traffic; these are addressed in the discussion of intermodal service.) Like bulk unit trains, carload traffic tends to be one-way – loaded to the receiver, empty back to the shipper.

Most carload traffic is door-to-door, although smaller customers without direct rail access or those who need less-than-carload quantities can be served by combined carload-truck services. “Transload” facilities accommodate the transfer of non-flowing materials (e.g., lumber, sheetrock, etc.) from carload to truck using conventional methods (e.g., forklifts, cranes, etc.). Similarly, “transflow” facilities accommodate the transfer of liquid or “flowing” materials (e.g., oils, plastic pellets, bakery flour, etc.) from carload to truck using very specialized pumping equipment. Transload and transflow commodities are moved from the shipper’s factory to a rail yard or siding near the receiver, then moved the final miles by truck for “just-in-time” use by the receiver.

Carload generally serves heavy products that are sensitive to transportation costs. However, it can be more difficult to achieve economies of scale with

carload traffic than with unit-train traffic because carload service involves a much higher degree of handling and management:

- Carload trains typically are not uniform in composition. They include a variety of railcar types, each of which must be collected from and distributed to specific customers. On a unit train, one hopper car full of coal is part of a larger shipment. But on a carload train, each car may be an individual shipment. Moreover, many cars are privately owned or in “sequestered” or dedicated service and, therefore, not interchangeable and available for use by other customers. The variety of car types and commodities increases administrative and physical-handling costs compared to unit train service.
- Carload train lengths vary greatly by intercity corridor and market, reflecting the different mixes and volumes of commodities moving between markets. The railroads collect many different types of cars from many different customers, classify and marshal them into long consists for the intercity move, and then break them into shorter consists for the final delivery. The railroads depend on a complex hub and spoke network to move consists and individual cars through the system. The shorter the intercity corridor and the more complex the mix of car and commodity types, the more difficult it is to achieve economies of scale in carload operations.
- Carload customers are more diverse than unit train customers. Carload users range from large customers generating hundreds of carload shipments a week to small customers receiving a handful of carload deliveries a month. The mix of large and small customers and the wide geographic distribution of origins and destinations make it difficult to handle all shipments profitably.

Intermodal (Container, Trailer, and Automobile)

Intermodal trains move truck trailers and containerized goods containing finished consumer goods, refrigerated foods, parts and tools for manufacturing, raw materials, post-consumer scrap – almost anything that can be packed into a container or truck trailer. For the purposes of this report, rail shipments of automobiles are also treated as intermodal traffic since they share many of the characteristics of intermodal merchandise (e.g., high value, time sensitive, etc.) and are handled in a similar manner. However, the railroads usually market and account for automobile traffic as a separate service.

Unlike unit train and carload traffic, intermodal traffic is typically two-way. Imported international containers may move inland from a seaport, be unloaded, then reloaded with export cargo (if available) or with purely domestic cargo (taking advantage of discounts offered by the railroads and container owners) for the “backhaul.” Similarly, auto trains may arrive at a port with export vehicles and depart with import vehicles.

Intermodal containers come in a variety of shapes and sizes. They range from 20 feet to 53 feet long and from 8 feet, 6 inches high to 9 feet, 9 inches high.

International container volumes are measured in TEUs. A 20-foot container is counted as one TEU, and a 40-foot container is counted as two TEUs. The 40-foot container is the most common type used in waterborne transportation. Domestic containers typically are 48 or 53 feet long, and are modifications of standard over-the-road truck trailers. Standard truck trailers also appear in intermodal service in sizes ranging from 28 to 53 feet long. Truck trailers and containers are handled on railcars in a variety of ways:

- **Container-on-Flatcar (COFC)** – Containers are placed directly on standard flatcars. A 90-foot flatcar will accommodate up to 4 TEUs.
- **Trailer-on-Flatcar (TOFC)** – Over-the-road trailers or containers mounted on truck chassis are placed directly on flatcars. Standard flatcars accommodate 2 to 4 TEUs; specialized spine cars take up to 10.
- **Double-Stack** – Containers are placed two-high, one on top of the other, in a special low-profile “well car.” Well cars may accommodate as few as four TEUs or as many as 20 TEUs, depending on their length. By stacking the containers, railroads can double (or more than double) the number of containers carried on a train, improving productivity and effective capacity, and reducing unit costs.

Automobiles are generally carried in specialized railcars that accommodate either two or three levels of vehicles. The vehicles are driven onto and off of the railcars. Both the “bi-level” and “tri-level” auto carriers have high vertical profiles and require overhead clearances similar to double-stack container traffic.

Intermodal service accommodates higher-value, lower-weight commodities than unit train or carload services. The service offers faster speeds, higher train frequency, better schedule reliability, and more visibility en route – albeit at a higher price – and is competitive with door-to-door trucking over longer distances (generally starting at 400 to 500 miles, depending on the equipment and corridor). The most efficient and cost-effective intermodal service is the unit train, which is the preferred method for serving high-volume corridors. Intermodal railcars can also be handled in combination with carload traffic as part of mixed merchandise trains. Although this can be costly, especially on routes that provide overhead clearance for single-stack intermodal cars only, it allows intermodal service to reach lower-volume customers.

More than any other rail service, intermodal depends on partnerships with trucking companies, seaports, and others in the transportation logistics chain. Each container or trailer or set of automobiles is an individual shipment, and there are a vast number of origins and destinations to be served. In response, both railroads and truckers have recognized that the best approach to this market is to let each mode do what it does best. Railroads handle the long-haul movement of large quantities of containers and trailers between major hubs such as seaports and major population centers, while truckers handle the short-haul movement to/from the customer’s “front door.” For example, merchandise manufactured and packed in a container in China may be imported to the U.S.

through the Ports of Seattle or Tacoma, trucked to the nearby intermodal rail facility, loaded onto a double-stack unit train, moved by rail to Chicago, transferred across town by truck from a Western railroad to an Eastern railroad, moved by rail to North Jersey, transferred to truck, taken to a nearby distribution center where the contents are transferred to smaller trucks, and finally delivered by van to a customer in Brooklyn.

Much of intermodal traffic is in higher-value consumer products and in import-export traffic. This creates two distinct patterns: high demand for suitable rail-car equipment leading up to and during seasonal shopping periods; and the concentration of intermodal rail traffic along a relatively few, high-density corridors connecting the nation's leading container ports and its primary consumer markets. Intermodal has been one of the fastest-growing segments of the rail industry.

What Is the Business Environment for Freight Railroads?

Class I Railroads

The Class I railroads operate on a national rail network that today is about half the size of what it was at its peak in the 1920s. The reduced size of the network is the result of two forces: competition with the trucking industry and deregulation. As private businesses facing stiff competition from trucks and shareholder pressure to generate profits, the nation's major railroads have divested themselves of lines and services with insufficient traffic density to adequately cover operating and maintenance costs. Abandonment has also occurred as a result of mergers and consolidations among the railroads. The most recent wave of mergers and reorganization was triggered by the economic deregulation of the rail industry in 1980. Today, there are seven Class I railroads, two of the largest of which – the UPRR and the BNSF – serve Washington State.

To improve productivity, and profitability, the railroads have been investing in double-stack cars, larger hopper and tank cars, higher weight capacity track, and stronger bridges. The high cost of these improvements has limited railroads to upgrading only the highest volumes and most profitable lines. Other lines have been downgraded, sold off to short lines, or abandoned.

As a result of the downsizing of the rail network and restructuring of the industry, railroad productivity has improved dramatically, with ton-miles of freight handled per employee quadrupling over the last decades. Costs have dropped: before 1980, rail was relatively more expensive than truck or water; today, it is more economical than truck or water for longer-distance freight moves. Shipment visibility is far greater today than in the past; most shippers are able to follow the progress of their shipments in near real-time and make rerouting decisions en route if necessary. And reliability has improved. This is driven in part by a shift from tonnage-based operating plans to schedule-based operating plans. Historically, freight railroads have held trains until they were full (i.e., until they reached a certain total tonnage or number of cars). Running full trains achieves maximum efficiencies of scale, but at the cost of reliability – in customer

delivery times, in crew schedules, in equipment availability. Pushed by shippers to provide more reliable service, all major railroads are now adopting schedule-based operating plans where trains run on fixed schedules, regardless of whether or not they are full. This has improved delivery-time reliability, especially in certain sectors like intermodal, and also has reduced operating costs by eliminating some of the crew and equipment uncertainty.²²

The gains in productivity and service quality have slowed the precipitous decline in rail market share that started before World War II and accelerated through the 1960s and 1970s; however, the gains have not been enough to significantly expand market share, which has hovered around 40 percent of all intercity ton miles carried by truck, rail, and water. There is some indication that rail market share has been increasing, especially in intermodal traffic, but the long-term outlook is for a flat or declining share of freight tonnage for the railroads. This is in part a reflection of structural changes in the U.S. economy, which is generating and moving more, relatively lighter and higher-value products and less heavy and bulky commodities, which have been the railroads' traditional markets, and in part a reflection of the railroads' continuing difficulty in competing on speed and reliability with trucks and air cargo carriers.

Competitive pricing has been a critical factor in the railroads' ability to stabilize and at least maintain its market share. Rail rates to shippers have dropped since deregulation, allowing the railroads to hold market share, but at the cost of revenue and profitability. Until recently, railroad revenues – whether measured in constant or current dollars – have dropped significantly and have been only partially offset by increases in productivity, sale of land, and other business strategies. The result has been a relatively low rate of return on investment for the railroads. Calculations by the U.S. Department of Transportation's Surface Transportation Board, which is responsible for economic oversight and regulation of the rail industry, show that the railroad industry's return on investment has been improving, but slowly. In the early 1980s, the railroads' return on investment fluctuated between 2 and 6 percent, compared to a cost of capital that ranged between 12 and 18 percent. In the last 5 years, the railroads' return on investment has been between 6 and 8 percent, compared to a cost of capital between 9 and 10 percent.²³ Individual railroads have done better – the BNSF, for example, reported a rate of return of 7.9 percent compared to a cost of capital of 10.1 percent in 2004, and a rate of return of 10.1 percent in 2005 – but the industry as a whole continues to generate less revenue than it needs. The recent rise in returns has in part occurred due to a rapid rise in traffic volumes

²²Ireland, P., R. Case, J. Fallis, C. Van Dyke, J. Kuehn, and M. Meketon, *The Canadian Pacific Railway Transforms Operations by Using Models to Develop Its Operating Plans*, Interfaces, Volume 34, Number 1, January-February 2004, pp. 5-14.

²³American Association of Railroads, *Railroad Profitability*, January 2006, available at www.aar.org, Railroad Information/Background Papers.

(especially related to import growth) without associated increases in capacity. This has allowed railroads to raise rates and generate greater profits, and has also resulted in recent runups in railroad stock prices. But bond ratings for the railroads remain relatively low grade and with returns hovering around the cost of capital, these companies remain relatively cautious about expensive, long-lived infrastructure investments.

The relatively low rate of return is a problem for the railroads because they are extraordinarily capital intensive compared to other industries. Between 1995 and 2004, the rail industry invested 17.8 percent of its revenues in capital. By contrast, U.S. manufacturing industries spent an average of 3.5 percent, with the electric utility industry topping the group at 11.6 percent. And with few exceptions, the rail industry must continue to make capital investments and maintain track, bridges, and locomotives across its network regardless of the business cycle. It cannot disinvest itself of mainline track or discontinue maintenance during recessions without stopping revenue-generating service. This situation has also encouraged the railroads to be highly risk averse.

The relatively low rates of return, the high maintenance costs, and lack of liquidity (i.e., the inability to quickly and easily sell track and right-of-way), has in the recent past made railroad stock less attractive to Wall Street and investors looking to invest in high growth and profit industries. This has resulted in a persistent shortfall or gap between what the railroads “should” be investing out of their revenues to maintain the rail network, expand it, and grow market share and what they can afford to invest. Through the 1990s, this shortfall was about \$2 billion annually for the Class I railroads. The gap has closed recently, but is still estimated at about \$1 billion per year despite record levels of investment by the railroads in recent years. The BNSF reported spending \$2.1 billion on capital improvements in 2005 and is planning to spend nearly \$2.6 billion in 2006. The UPRR spent over \$2.8 billion on capital investment in 2005. It should be noted that in the case of both railroads, the largest share of capital investment goes to “rebuilding” existing capacity (railroads “burn up” their infrastructure quickly from constant use), or purchasing new equipment (with an emphasis on locomotives). Relatively little is left over for infrastructure expansion and this investment is focused on high growth, high density, and most profitable lanes. This has tended to favor expansion in the Pacific Southwest and along the coal lines coming out of the Powder River Basin.

Table 2.9 provides a brief snapshot of the financial performance the UPRR and the BNSF. Both are doing reasonably well, with BNSF enjoying slightly better business performance over the period.

Table 2.9 Key Financial Parameters for BNSF and Union Pacific

	Union Pacific			BNSF		
	2005	2004	2003	2005	2004	2003
Operating Revenues	\$13,578	\$12,215	\$11,551	\$12,987	\$10,946	\$9,413
Operating Income	\$1,795	\$1,295	\$2,133	\$3,997	\$2,698	\$2,575
Net Income	\$1,026	\$604	\$1,585	\$1,531	\$791	\$777
Per-share net diluted	\$3.85	\$2.30	\$6.04	\$4.01	\$2.10	\$2.19
Operating Cash Flow	\$2,595	\$2,257	\$2,443	\$2,606	\$1,803	\$1,687
Depreciation	\$1,175	\$1,111	\$1,067	\$1,075	\$1,012	\$910
Capital Expenditures	\$2,169	\$1,876	\$1,752	\$1,750	\$1,527	\$1,726
Year-End Position						
Total Assets	\$35,620	\$34,596	\$33,496	\$30,304	\$28,925	\$26,939
Total Debt	\$7,416	\$8,131	\$7,989	\$6,698	\$6,051	\$6,440
Common shareholder's equity	\$13,707	\$12,655	\$12,354	\$9,925	\$9,311	\$8,495
Financial Ratios (%)						
Debt/Capital ratio	35.1	39.1	39.3	27.3	26.1	28.7
Return on equity	7.8	4.8	13.8	15.6	8.9	9.5
Operating Data						
Commodity revenue	\$12,957	\$11,692	\$11,041	\$12,606	\$10,742	\$9,285
Carloads (000)	9,544	9,458	9,239	10,024	9,536	8,646
Revenue ton-miles (000)	548,800	546,300	532,900	596,575	570,688	508,200
Operating Ratio (%)	86.8	89.4	81.5	76.8	84.3	82.1
Average employees (000)	49.7	48.3	46.4	39.5	37.6	36.6

Note: Units in millions, except per share amounts, ratios, and employee statistics.

Overall, the rail industry today is stable, productive, and competitive, with enough business and profit to operate, but not to replenish its infrastructure quickly or grow rapidly. Until recently, this was a tolerable, even desirable, situation for the railroads. The railroads' return on investment was increasing, a major achievement of an industry that just a few decades ago was struggling financially, and the inability to expand infrastructure rapidly was seen as a somewhat useful constraint on the temptation toward overextension and overinvestment.

However, several trends have converged in recent years to make the railroads' situation less tolerable. The volume of trade, especially of intermodal cargo moving through West Coast ports has soared, straining the railroads' capacity to handle it. Truck costs have increased (because of rising diesel prices, highway congestion, and a shortage of long-haul truckload drivers at prevailing wages), causing shippers to divert traffic to the railroads. And as the growth of rail traffic has filled up the (downsized) capacity of the rail network, the reliability of rail

service has dropped, especially for low-volume shippers at the same time rates have risen.

This has set up a sharpening conflict between the different visions of the how the rail system should perform. The railroads want to expand the rail system to generate higher rates of return, but remain highly risk adverse to rapid capital investment because of the high cost and long-lived nature of their investments. Shippers want expanded rail service that is competitive with trucking on both price and quality of service. Having been conditioned to years of declining rail prices and improving services, shippers are uncomfortable with the seemingly sudden reversal that has made the railroads price-givers not price takers. And the public wants railroads to solve urban highway congestion, but not by expanding rail lines through communities or rail terminals in backyards.

To deal with this new business environment, the railroads have adopted a number of strategies. A primary strategy has been to focus on their “hook and haul” business – the high-density, long-haul freight movements where large volumes enable economies of scale in operation and keep service profitable. This has meant giving priority to intermodal container movements from West Coast ports, unit coal trains from the Powder River Basin to Midwest, Southeast, and East Coast utilities, and unit grain trains to Pacific Northwest and Gulf ports. Railroads face especially strong political pressure to maintain capacity, service, and price in the energy and intermodal markets, so infrastructure expansion has been focused on the coal lines out of Powder River Basin and the intermodal lines out of Ports of Los Angeles and Long Beach. While important to both the BNSF and the UPRR, the Pacific Northwest market is and will likely remain a second priority in the railroads’ nationwide investment plans.

A second strategy has been to use pricing to turn aside lower-profit traffic. This is happening across all rail markets: intermodal traffic is squeezing out carload traffic. The use of market pricing to allocate rail service makes business sense from the railroads’ perspective, but for individual shippers who are “captive” to the pricing of a single railroad and who may not be able to afford higher-cost trucking, higher rail prices mean lower profits, smaller market share, and in some cases the risk of business failure.

Because the carload business still accounts for a large and in most cases a profitable element of the railroads’ business, the railroads are pushing a third strategy, which is to encourage consolidation of carload traffic at centers on their main lines. Logistics parks, transload centers, and grain consolidation facilities enable the railroads to continue to provide carload service, but do it as a more profitable “hook and haul” operation. To provide collection and distribution services to these centers, the Class I railroads continue to transfer low-density branch lines to short line railroads, who can operate at lower cost than the Class I railroads, and encourage shippers to truck shipments to the centers. This has been an effective strategy in maintaining rail services in some markets, but at the cost of transferring risk to the short line operators and, where trucks are substituted for rail, increased pavement and bridge maintenance costs to the public sector.

Finally, underpinning all three strategies is a continuing effort by the railroads to increase velocity – to increase the volume and speed of freight that can be moved through the rail system. Actions include developing process improvements to increase effective capacity; applying new technology such as computerized train control to improve operations; buying new locomotives; adding more train crews; buying more cars; and building new infrastructure (e.g., yards, sidings, and track).

Despite these initiatives, the railroads have not been able to keep pace with demand. They have invested conservatively, not fully anticipating the current surge in demand for intermodal, coal, and carload services. Their major challenge remains generating and attracting sufficient capital to keep up with demand.

Short Line Railroads

Short lines perform a critical transportation function for local agriculture and industrial products shippers, connecting them to the Class I railroad mainline services. The short line industry is a mix of profitable and marginal performers. The volume of traffic handled by a short line has a direct impact on track maintenance levels, speeds, service reliability, and ultimately the financial viability of the short line service. High-volume markets and lines do relatively well; low-volume markets and lines struggle. Consolidation of short line ownership and some consolidation of low-density lines and collector/distributor functions has improved the business outlook for short lines in some areas, but in very low-volume markets or where short lines do not connect to emerging consolidation centers, short lines in Washington State and elsewhere are not meeting critical volume thresholds, and services and investment in track and equipment is declining.

Beyond volume, short lines face three specific problems as an industry: 1) they face high costs to upgrade track and bridges to carry the newer, heavier, higher-capacity, 286,000-pound cars preferred by shippers and Class I railroads; 2) railcar availability, which is partially controlled by the Class I railroads, is a continuing problem; and 3) the Class I railroads set prices and access conditions. While short line traffic generates significant amounts of revenue for the Class I railroads (16 percent for BNSF, for example), the Class I railroads may or may not provide joint rates, depending on whether the Class I railroads want the traffic.

2.7 PASSENGER RAIL USERS

Who Are Passenger-Rail Users?

There are two broad groups of users of passenger rail in Washington State: 1) intercity passengers who use the Amtrak services, and 2) commuters who use the Sound Transit Sounder services. Each of these groups reflects different needs

and requirements, and the competing transportation services in each market are very different.

Intercity passengers represent several major uses. Based on recent survey results, intercity rail passengers on the Amtrak Cascades line in Western Washington use the system for the following reasons:²⁴

- 49 percent travel for vacation/recreation;
- 31 percent to visit family or friends;
- 13 percent for business/commute; and
- 7 percent for personal business.

To a large extent, these user characteristics reflect the characteristics of the current services offered. Today, there are relatively few trains running between Seattle and Portland and even fewer between Seattle and Vancouver, BC, and these trains take a relatively long time to transit these distances due to operational problems in the corridor. Operational problems also affect reliability of service, which in turn affects ridership. Thus, for those categories of use that require greater frequency, convenience, speed, and reliability (business and commuter travel), ridership potential may be higher than current levels of usage.

The Amtrak stations in Washington State with the most activity in 2005 were Seattle (650,061); Tacoma (102,255); Vancouver (72,266); Bellingham (56,087); Spokane (42,491); Olympia (42,404); Everett (39,532); and Edmonds (28,404). Overall activity in Washington State was 1.16 million in 2005, an increase of 3.8 percent from 2004.

Commuter rail serves commuters to and from work almost exclusively, although Sounder does run some special event trains. These are users for whom travel time, reliability, and cost are major choice factors. Sounder ridership in 2005 is up to almost 1.27 million. Additional trains have been added over the last 4 years, and each train addition has created a big bump in ridership, indicating that the market has not yet been saturated.

Who Provides Passenger-Rail Services and What Are Their Market Areas?

Intercity Rail

WSDOT's Amtrak Cascades rail program provides service in the highly populated Western Washington corridor that stretches from Vancouver, British Columbia in the north through Everett, Seattle, Tacoma, and Olympia and continuing south to Portland, Oregon. WSDOT implements the program in coordination with a number of key partners, including Amtrak, Sound Transit,

²⁴Four Season Demographic, Behavioral, and Attitudinal Profiles of Amtrak Cascades Riders, WSDOT, 2003.

BNSF, the State of Oregon, the Province of British Columbia, the Federal governments of the United States and Canada, and local jurisdictions. Table 2.10 below shows the roles of these organizations. The other services that Amtrak operates in Washington State are the Coast Starlight between Seattle and Portland and the Empire Builder between Seattle and Spokane, as well as between Portland and Spokane.

The Amtrak Cascades service currently provides three round trips daily between Seattle and Portland (with a fourth to start after July 1), one round trip daily Seattle to Bellingham, and one round trip Seattle to Bellingham to Vancouver, BC. The Coast Starlight provides one daily roundtrip between Seattle and Los Angeles. The Empire Builder provides one daily trip Seattle to Spokane and one daily trip Portland to Spokane and in both cases travel on to Chicago.

The U.S. Congress and Executive Office have repeatedly called for reform of Amtrak and national passenger rail policy, particularly with respect to funding. If these reform efforts result in reduced Federal grants or modify Amtrak's existing operating rights on the private freight-rail lines, the cost that is passed through to Washington State could increase significantly.

Table 2.10 Amtrak Cascades Partners

Jurisdiction/Agency	Role in Amtrak Cascades Service (2005)
Amtrak	Operates the trains and also provides operating funding for some routes, as well as funds for train equipment and capital construction projects
WSDOT	Provides funding, planning, quality control, and other functions associated with the <i>Amtrak Cascades</i> service
Sound Transit	Funded extensive improvements to the BNSF's mainline between Everett and Tacoma that support safe and efficient movement of freight and passenger trains in central Puget Sound
BNSF Railway Company	Owns the tracks
The State of Oregon, through its DOT	Provides operating and capital funds for <i>Amtrak Cascades</i> service between Portland and Eugene, Oregon and capital funds for the <i>Amtrak Cascades</i> service between Portland OR and Vancouver WA.
Federal Governments of the U.S. and Canada	Oversee customs and immigration activities for <i>Amtrak Cascades</i> international trains
U.S. Federal Government	Provides grant dollars for corridor safety improvements
Local Jurisdictions, including Cities and Port Districts	Provided funds for new and renovated train stations, as well as other improvements that support the efficient movement of people and vehicles in the vicinity of the stations and the movement of rail freight at the region's major port facilities

Source: *Draft Short Range Plan for Amtrak Cascades*, Exhibit 1-2, page 1-4; Washington State DOT, February 2006.

For Amtrak, about 68.2 percent of state activity (boardings and alightings) were on Amtrak Cascades service, 13.9 percent were on Coast Starlight service, and 17.9 percent were on Empire Builder service.²⁵ In total, about 92.2 percent of activity took place at the 11 stations along the Vancouver, British Columbia-Seattle-Portland, Oregon corridor and 7.8 percent took place at the other 6 stations located throughout the State. Again, these ridership patterns may reflect current services and are not necessarily a reflection of demand. There have been calls for additional services to Central and Eastern Washington to connect with the Puget Sound region. Detailed market assessments of potential regional services have not been conducted in all cases.

For Amtrak Cascades, the top 5 origin-destination pairs in Federal Fiscal Year 2005 (October 2004 to September 2005) comprised 58.2 percent of total Amtrak Cascades riders²⁶:

- Seattle – Portland, Oregon 29.8 percent;
- Seattle – Vancouver, British Columbia 8.7 percent;
- Tacoma – Portland, Oregon 7.4 percent;
- Seattle – Bellingham, Washington 6.7 percent; and
- Seattle – Vancouver, Washington 5.7 percent.

Commuter Rail

Sound Transit provides Sounder commuter rail services in the Puget Sound region, with weekday peak-period service between Seattle and Tacoma and between Seattle and Everett. Sounder commuter trains are operated by BNSF and maintained by Amtrak, while Sound Transit owns the stations and provides security. BNSF owns the railroad tracks that Sounder operates on. Sound Transit has ongoing partnerships with WSDOT, BNSF, and local governments.

Table 2.11 summarizes the scheduled departure times, arrival times, and travel times for the Sounder commuter rail services.

²⁵ *Amtrak Washington State Ridership*, e-mail attachment from Amtrak, April 2006.

²⁶ E-mail attachment from WSDOT, April 2006.

Table 2.11 Summary of Weekday Sounder Service Schedules

Line Endpoints	Departure Time	Arrival Time	Travel Time
South Line (Seattle – Tacoma)			
Tacoma Dome – King St Station	5:45 a.m.	6:45 a.m.	1:00
	6:20 a.m.	7:20 a.m.	1:00
	6:45 a.m.	7:45 a.m.	1:00
	7:10 a.m.	8:10 a.m.	1:00
King St Station – Tacoma Dome	4:20 p.m.	5:20 p.m.	1:00
	4:45 p.m.	5:45 p.m.	1:00
	5:10 p.m.	6:10 p.m.	1:00
	5:40 p.m.	6:40 p.m.	1:00
North Line (Seattle – Everett)			
Everett Station – King St Station	6:10 a.m.	7:08 a.m.	0:58
	6:40 a.m.	7:38 a.m.	0:58
King St Station – Everett Station	4:33 p.m.	5:31 p.m.	0:58
	5:13 p.m.	6:11 p.m.	0:58

Source: Sound Transit web site:
<http://www.soundtransit.org/riding/fac/sounder>.

For Sounder, based on fourth quarter 2005 data, about 85.7 percent of ridership is on the Seattle-Tacoma line and 14.3 percent is on the Seattle-Everett line.²⁷

How Well Do the Services Work?

Intercity Rail

Key indicators of the performance and viability of intercity passenger services are ridership levels, on-time performance, speed, and farebox recovery (a measure of the financial viability of the service). In addition to ridership, WSDOT also tracks on-time performance and farebox recovery for Amtrak Cascades on a regular basis:

- **On-time performance** – An Amtrak Cascades train is considered on-time if it arrives at its final destination within 10 minutes or less of the scheduled arrival time. The on-time performance goal is 80 percent or better.

²⁷Fourth Quarter 2005 Service Delivery Report, Sound Transit.

- **Farebox recovery** – Farebox recovery is defined as the percentage of total operating costs that is offset by operating revenues (passenger fares, food and beverage, and mail).

Table 2.12 shows the five-year trend in these performance indicators.

Table 2.12 Amtrak Cascades Performance Indicators

	2001	2002	2003	2004	2005	Change, 2001-2005
Ridership, State Supported	359,327	379,001	385,585	398,121	420,920	+17.1%
Ridership, All Trains	560,381	584,346	589,743	603,059	636,892	+13.7%
On-Time Performance	76.3%	70.8%	71.9%	68.7%	60.1%	-21.2%
Farebox Recovery	41.7%	43.0%	39.9%	49.7%	47.3%	+13.6%

Source: *Measures, Markers, and Mileposts from December 2001 to December 2005*, WSDOT.

Note: Two of the four Seattle-Portland, Oregon trains are supported by Washington State, and two are supported by Oregon. Ridership for the Oregon-supported trains is included in “All Trains,” but not in “State Supported.” On-time performance and farebox recovery are calculated for state-supported trains only.

Because the Amtrak Cascades service operates in a corridor where track is often shared with two freight railroads and the commuter service, the relationship amongst these services and impacts on performance bears some explanation. As already alluded to, ridership is a strong function of the frequency and quality of service offered. Quality of service (measured in terms of running time and on-time performance) is a function of operations and capacity of the corridor. Current Amtrak Cascades ridership is consistent with the frequency of service offered (i.e., one or more trains have been sold out on 200 days during the calendar year).

On-time performance is a more complex story and reflects significant operational and capacity issues in the corridor. The decline in on-time performance coincides with increased freight demand in the corridor. In particular, growth in intermodal traffic from the ports and congestion on the BNSF’s main intermodal route through Steven’s Pass (and the limited utility of the Stampede Pass reliever route for intermodal due to the lack of double-stack clearance through the tunnel) has forced more traffic onto the north-south corridor to access the Columbia River Gorge lines as a reliever route for intermodal traffic. This has exacerbated the effect of several known operational problems in the north-south corridor affecting performance and reliability of both freight and passenger trains. WSDOT and Amtrak continue to work with BNSF traffic managers in an effort to reverse the on-time performance trend.

The general trend in farebox recovery has been positive, except for a slight dip in the last year. Using data from FY 2001, only 3 of the 18 state-supported Amtrak services throughout the country had farebox recovery of over 50 percent, so the

trend for Amtrak Cascades puts it among the national leaders. The goal for the system is to be able to support operations almost entirely on fares.

Commuter Rail

Table 2.13 shows the five-year trend in ridership and farebox recovery for the Sounder commuter rail service.

Table 2.13 Sounder Performance Indicators

	2001	2002	2003	2004	2005	Change, 2002-2005
Ridership	494,600	817,405	751,163	955,298	1,268,291	+156.4%
Farebox Recovery	n/a	13.1%	13.9%	14.1%	n/a	n/a

Source: 2001-2004 National Transit Database, Tables 19 and 26; Federal Transit Administration; Fourth Quarter 2005 Service Delivery Report, Sound Transit.

Sound Transit on-time performance is defined as the average of all trains in a month arriving at a terminus station within seven minutes of schedule. The on-time performance goal is 95 percent. Thus far in 2006, Sound Transit on-time performance is about 93 percent on the Seattle-Tacoma line and about 96 percent on the Seattle-Everett line.²⁸ On-time performance of commuter trains should not be compared with performance of intercity trains, since the latter are traveling over longer distances and in longer operating windows, yet the criteria for what is considered on-time is not that different.

The substantial growth in ridership on the Sounder trains reflects the addition of new trains throughout the reporting period. Each new train brought a significant increment of ridership, indicating strong demand for these services.

What Is the Growth Forecast for Ridership?

Amtrak Cascades has two separate sets of ridership forecasts: one set from the Short-Range Plan that is based on the implementation of funded projects, and another set from the Long-Range Plan that is based on the implementation of improvements that have not yet been funded:

- The short-range ridership forecasts indicate that Amtrak Cascades ridership will increase from 429,800 in 2006 to 505,100 in 2007 due to the addition of the fourth train between Seattle and Portland.
- With no further service changes, Amtrak Cascades ridership is projected to then increase by 0.5 percent annually – reaching 528,500 in 2016.

²⁸For Amtrak Cascades: *Measures, Markers, and Mileposts for the Quarter Ending December 31, 2005*, p. 70; WSDOT, February 2006. For Sounder: *2004 National Transit Database*, Table 26, Federal Transit Administration.

- If a second train to Vancouver, British Columbia is added in 2008, then ridership is projected to increase by 10.6 percent from 2007 to 2009, and then increase by 0.5 percent annually thereafter – reaching 578,800 in 2016.

The long-range ridership forecast, which assumes the implementation of substantial improvements to Amtrak Cascades services above and beyond the funded short-range improvements, would increase ridership along the corridor to nearly 3 million annually in 2023. These ridership levels require that service frequencies, on-time performance, and Seattle to Portland travel times are all improved relative to current performance. The improvements are designed to ensure that even with forecast growth in freight traffic, capacity in the corridor will be sufficient and operational bottlenecks that affect passenger rail services are eliminated, at least with respect to passenger operations. The degree to which these improvements are also able to provide benefits to the freight railroads will depend to some extent on their operating practices with the infrastructure improvements and their ability to resolve capacity issues and bottlenecks in the east-west corridors.

The ridership projections developed by WSDOT and Amtrak were based on a number of assumptions, including that the average cost of driving will remain unchanged from long-term trends and that automobile travel times between cities will remain unchanged throughout the 11-year timeframe. To the extent that rising fuel prices and congestion levels affect both auto and air travel alternatives, there could be a positive impact on Amtrak ridership. Ridership levels in 2005 indicate that rising fuel prices do tend to increase rail ridership.

It is assumed that Sounder ridership will continue to grow significantly as additional service is implemented, from 1.2 million passenger trips in 2006 to 2.6 million passenger trips in 2011 – a 5-year increase of 117 percent. The projections are based on the implementation of additional services as described to follow.

How do Capacity Issues Affect Passenger Rail Service?

Passenger service is significantly affected by capacity limitations that affect freight service. This is especially true of capacity limitations that cause freight service to queue on main tracks. In general, such areas include between Portland and Vancouver Junction (north of Vancouver, Washington), between Woodland and Ostrander, between Titlow and Puyallup, at Swift (the station immediately south of Blaine at which border inspection of freight trains occurs), and between Swift and the Canadian National Thornton Yard in Surrey.

Passenger service is also affected by the general capacity limitations that do not cause significant queuing. For example, the excessive running time between the Bow and Ferndale sidings is a significant capacity limitation, but is not a ‘bottleneck’, because of the other segments of the line on which traffic regularly significantly exceeds capacity and queuing occurs.

Passenger service is also affected by capacity limitations in infrastructure associated only with passenger service. This includes the limited access for simultaneous train movements at Portland and the north end of King Street station in Seattle; the single-track operation associated with the Tacoma and Everett stations and the south end of King Street Station; and the single-side platform arrangement at Vancouver, Kelso, Centralia, and Centennial (Olympia-Lacey). The single-track route between the Seattle passenger car maintenance yard and King Street Station and the route conflict between through trains and movements between these facilities also presents a significant capacity limitation.

What Are the Plans to Serve Future Passenger Demand?

The following are short-range improvements for Amtrak Cascades services:

- Additional improvements through the year 2015 include additional main line tracks, siding upgrades, junction improvements, high-speed crossovers, and new storage tracks. Funding for these projects have been mostly secured, although in some cases the project cost estimates are conceptual and could change over time.
- An optional short-range project involves the completion of a British Columbia supported infrastructure project at Colbrook that would allow for the number of daily trains in each direction between Seattle and Vancouver, British Columbia to increase from one to two.

The long-range improvements for Amtrak Cascades services are the following:

- Increase the number of trains in each direction between Seattle and Portland from 4 trains per day to 13 trains per day. Increase the number of trains in each direction between Seattle and Vancouver, British Columbia from one train per day to four trains per day.
- Reduce the one-way travel time between Seattle and Portland from 3.5 hours to 2.5 hours, reduce the one-way travel time between Seattle and Vancouver, British Columbia from 3.9 hours to 2.6 hours.

These significant increases in service frequency and speeds are based on the implementation of project improvements that include grade crossing upgrades, enhanced train signals and communication systems, new passenger trains, upgraded passenger rail stations, and improved tracks and facilities.

The following are plans for expanded Sounder commuter rail services:

- Complete track and signal work on both lines, including the construction of double tracks in many locations.
- Complete purchase and upgrade of the Tacoma to Lakewood rail line for Sounder commuter train service.
- Increase Sounder service provision from two round trips to four round trips per weekday between Seattle and Everett (planned for end of 2007), and from

four round trips to nine round trips per weekday between Seattle, Tacoma, and Lakewood (planned to be phased in during 2007 to 2008). One of the nine round trips would be a “reverse commute” service.

- Add new Sounder stations and parking at Mukilteo (north line), South Tacoma (south line), and Lakewood (south line); and upgrade stations and/or parking facilities at Everett, Edmonds, Sumner, and Puyallup.

What are Key Issues Facing the Washington State Passenger Rail Services?

Cost to Reach Critical Performance/Ridership Levels on the Intercity Service Is Substantial and the Nature of Benefits Is Complex. Ever since the Washington State rail program was initiated, it has been planned under the assumption that certain performance levels had to be achieved to attract and retain ridership. The operations of the freight railroads (more specifically the BNSF) are taken as a given in evaluating operational performance of the passenger services. This means that if bottlenecks exist in the passenger corridor as a result of increased traffic and a particular mode of operations, these bottlenecks must be eliminated in order to maintain service levels. Because there continues to be some degree of uncertainty about how the BNSF will operate in the future, certain assumptions need to be made in planning the passenger service. The objective of passenger investment is to achieve this level of performance and to ensure no change in freight-rail utility. This results in a fairly expensive long-term investment program. In evaluating the costs and benefits of this program, the WSDOT passenger rail program considers the direct benefits of the passenger rail program to the State and passengers, including cross-modal impacts (e.g., reduction of highway congestion), but it does not attempt to calculate freight-rail benefits. Nor does it directly address how to compare the benefits and costs of passenger rail investments with non-rail alternatives – especially to the degree that these alternative modal projects may include embedded subsidies for initial capital investment. Each of these issues suggests some of the complexity of evaluating costs and benefits of passenger rail projects in joint operations corridors. The approach will likely need to be expanded and further refined as part of a policy framework that is meant to consider all public and private costs and benefits and their allocation.

Another issue is that assumptions about the benefits of passenger rail as previously calculated do not fully account for the impact of rising fuel prices on future demand for rail services.

Identification of Freight-Rail Benefits of Passenger Programs and Allocation of Costs Is Complex. The question often comes up as to whether the planned investments that would be made as part of the WSDOT passenger program would create benefit to freight railroads. The BNSF has generally maintained that most (but not all) of the projects are needed in order to ensure that passenger trains receive the level of service they require; and that in conditions of operational bottlenecks, the impact of passenger operations, when coupled with freight operations, does not ever cause the premium services of the freight rail-

roads to be degraded. In order to ensure that this level of service is achieved, the State has often been willing to pay a substantial share, if not all of the cost of improvements, even when there may be some freight benefits of the projects.

In 2001, WSDOT, as part of its planning for future phases of the passenger program, conducted detailed simulation modeling of the north-south corridor using the BNSF's own simulation model. WSDOT consultants provided the model inputs, which were reviewed by BNSF staff, and BNSF ran the models. Scenarios were run with desired future passenger service and projected freight growth, as well as a scenario which assumed no growth in passenger service, but projected freight growth. The latter was run to determine whether or not there would be sufficient capacity to handle freight growth alone. The results showed that BNSF would need additional capacity in this corridor at some point in the forecast period.

Today, there appears to be sufficient main line capacity in this corridor to accommodate both passenger and freight traffic at current volumes. However, there are specific operational problems which will need infrastructure fixes that impede the ability of the corridor to operate smoothly in many instances. Further, capacity shortfalls in the east-west system tend to create spillover operational problems in the north-south corridor. An example of this is when trains coming to Tacoma from the Columbia River Gorge "time out" for hours of service limits south of Tacoma, having experienced delay east of Vancouver. These timeouts will drive effective capacity of the lines on which the trains are parked, either to zero or very low levels. Because of the inter-relationship of the north-south corridor and the east-west corridors, it is possible that the freight railroads may not be able to take full advantage of the improvements that will be made in the north-south corridor as part of the Amtrak program until capacity issues in the east-west routes are fully resolved.

3.0 Findings and Conclusions

3.1 FINDINGS

The Washington State rail network is at or near capacity now; service quality is strained and rates are going up. The study evaluated current train volumes on all main lines and compared these volumes with practical capacity (capacity at which trains on the system are all moving without incurring significant delay or experiencing significant operational problems). This analysis shows that capacity is most severely constrained in the east-west corridors and north of Seattle. The line from Everett to Wenatchee over Stevens Pass is already congested, and lines from Wenatchee to Spokane, Vancouver to Wishram, and Pasco to Lind are all severely constrained. The line over Stampede Pass, while not congested today, is severely limited as a reliever route because the Stampede Tunnel lacks clearance for double-stack trains. Future growth, most notably in intermodal volumes through the ports, will worsen this situation even with the operational changes that the Class I railroads are making to try to increase velocity without major infrastructure investment. Additional analysis shows that, while the north-south line between Seattle and Vancouver, WA is not capacity constrained on the mainline, there are numerous bottlenecks, many related to terminal capacity shortages and port access, that affect operations in this corridor today. This is likely to worsen as capacity constraints over Stevens Pass force more intermodal traffic south to the Columbia River Gorge.

Freight demand for use of the Washington State rail system is growing, but much of this growth is driven by shippers and receivers outside of the State. Today the largest volume of traffic by tonnage moving on the rail system in Washington State is agricultural products moving inbound. This is mostly grain exports coming from the interior U.S., and it is increasingly moving on large unit trains. Volumes of these products are expected to continue growing and needing capacity on the Columbia River Gorge lines. Intermodal cargo represents the second largest category of cargo by tonnage and the largest in terms of number of rail cars. This is projected to be the fastest growing component of Washington State freight-rail demand. Most intermodal cargo is moving from the ports into the interior U.S. Waste and scrap material is a fast growing cargo that is mostly local in nature. Despite the dominance of intermodal imports and agricultural exports in the future rail traffic picture for Washington State, there are local industries that will generate growth opportunities for the railroads. Transportation equipment and lumber and wood products are rail cargoes manufactured by local industries that also show growth potential. The problem with these cargoes is that these move in carload manifest trains and often come to the railroads in small volume per shipper in widely varying car types for widely varying origins and destinations. If the Class I railroads continue to prefer intermodal and bulk

unit train traffic to mixed carload, Washington State rail shippers may need to look to alternative rail transfer approach or risk further declines in service.

The railroad industry is not keeping pace with demand. Railroading is one of the most capital intensive industries in the U.S. Much of the capital investment is devoted to replacing “used up” capacity as rail traffic places enormous wear and tear on underlying infrastructure. Railroads also spend much of their capital budgets on power and other equipment. This does not leave much left over for adding new capacity. Capacity limitations and the recent surges in demand have allowed Class I railroads to increase their rates and profits and for the first time in many years, they are earning returns that cover their cost of capital. But even in this situation, the Class I’s are being very cautious in their investment strategies. Both the Burlington Northern Santa Fe (BNSF) and the Union Pacific (UPRR) have investment strategies that emphasize increasing velocity through the system by operations strategies first and infrastructure expansion last. They are also focusing much infrastructure investment on the highest density, most competitive, and most politically sensitive corridors (Pacific Southwest and the lines out of the coal fields of the Powder River Basin).

Class I railroads are attempting to change their business model. The railroads are trying to emphasize long haul, hub-to-hub or point-to-point, service in high density corridors. This is the least operationally complex type of service, and it takes advantage of the low average cost of line-haul movements. The railroads are also attempting to change operational practices to get more throughput from existing infrastructure. This has meant practices such as building longer trains, standardizing equipment with fewer car options, trying to get customers on industrial leads and spurs to make site improvements, and supporting transload centers and consolidation facilities. In some instances, these operational changes are working to improve productivity but in other cases they are creating new operational challenges (for example, longer trains that cannot access terminals and end up blocking mainlines and crossings). Railroads are also using pricing as a demand management tool to encourage traffic that is easiest to serve and most profitable, and to discourage traffic that is difficult to serve and least profitable.

Short line railroads will continue to play an important role serving carload traffic in Washington State, but some of the most financially tenuous lines will find it difficult to offer quality of service that is necessary to retain markets. For those short lines that can accommodate to the new business models of the Class I’s (consolidating traffic and delivering it to the Class I’s as they wish to receive it), rates will be favorable and they will see an increasing share of carload traffic coming their way. But a number of short lines in the State are not able to offer service that can meet shipper transit time and cost needs. In some cases, the shippers are already moving to alternative modes and their products are still competitive. In the agricultural markets of Eastern Washington State, it may as often be the smaller grain loading facilities that suffer if short lines fail.

International trade growth will continue to dominate growth in rail traffic and rail connections will be critical to port competitiveness. The forecasts prepared for this study show significant growth in container trade with Asia and much of this will end up on a train going east out of the Port of Seattle or the Port of Tacoma. Grain exports through the Columbia River ports are also expected to continue rapid growth. A number of recent studies suggest that there will be time periods over the next 30 years in which some ports will have insufficient terminal capacity and rail access to meet throughput demands. Ocean carriers and importers will move their cargo through a variety of ports to mitigate the impacts of this type of shortage. In addition, ocean carriers and importers will also move rapidly to shift cargo from one port to another in response to rate competition and landside access issues. Forecasts for the Ports of Seattle and Tacoma have already been adjusted downward over the last year to reflect a rebound in service and rail access improvements in Southern California in response to rail congestion problems in that region. While there will be enough trade traffic for all West Coast ports to experience growth, there will be competition and rail access will be an important factor in this competition.

Passenger rail ridership in Washington State is effectively capped by current capacity, bottlenecks, and associated limitations on service frequency. Passenger rail will continue to compete for access to capacity on a strained rail network. There are a number of critical bottlenecks that must be resolved in the north-south corridor if intercity rail service in this corridor is to be able to increase without serious deterioration in service quality. This corridor is also likely to become capacity constrained based on freight growth projections alone, especially if the only viable alternative to the Stevens Pass route is the Columbia River Gorge route (which must be accessed from the north-south corridor).

3.2 CONCLUSIONS

Ensuring future competitiveness of Washington's international trade ports will require the resolution of a mix of mainline capacity, access/egress, and intermodal terminal capacity issues. This will require partnerships among the ports, the State, the Class I railroads, and local governments and may require the use of new financing mechanisms. This study projects significant growth in international intermodal cargo moving through the Ports of Seattle and Tacoma. This is consistent with Pacific Rim trade forecasts for which all of the West Coast ports in North America are planning. In terms of rail car units and trains, this could be the driver of rail traffic growth on the Washington rail system. These ports and the trade-related services that they provide bring substantial economic benefits to Washington State and the nation as a whole. However, the level of growth forecasted is subject to competitive pressure. The existing capacity constraints and local bottlenecks could affect the ability of the ports to achieve forecasted growth. Planning for the future needs of the intermodal rail system supporting international trade from Washington seaports requires a comprehensive approach that links tradeoffs in operations with infrastructure investment

strategies. Solving the problems facing this system will also require an expensive mix of mainline capacity improvements in the east-west rail corridors, bottlenecks in the north-south corridor, local access improvements linking the ports and intermodal terminals with the mainline, and additional intermodal terminal capacity. The ports, the State, the Class I railroads, and local governments may all need to contribute in some way to developing these strategies. The next phase of this study needs to evaluate several different comprehensive strategies that include different mixes of infrastructure projects, different funding mechanisms, and different governance structures for implementing the improvements.

Addressing capacity issues alone may not be sufficient to ensure that the Washington State Rail system is responsive to the needs of traditional carload shippers and receivers within Washington State. Given changing business models of the Class I railroads and their approaches to improving velocity through operations, the low density, small shipper markets in which many of Washington State's traditional rail users find themselves are likely to continue to see declines in service even if capacity in the system is increased. The railroads will continue to push customers to new operational practices, and in some cases, this may require that customers make site investments. The State will need a clear policy on how best to address the needs of these shippers in the context of this changing business environment.

Short line railroads in Washington State will continue to have financial difficulties that will affect service quality and availability. The impacts of this situation, while not limited to agriculture, will have its most noticeable impacts in this sector. Short line railroads in very low density corridors will continue to feel financial pressures. Some of this will be the result of changing business models of the Class I's and pricing impacts on the short lines. It will also be the result of competition from new product consolidation facilities that cannot be accessed by existing short lines, as well as the impacts of deferred maintenance on service quality (and the associated responses of shippers looking for better service). The primary economic impact will not always be on shippers (i.e., it may have primary impact on smaller product loaders and consolidators) and, therefore, should not be assumed a priori to negatively impact the competitiveness of the State's agricultural sector. However, the impacts of declining short line services will have implications for the public sector in terms of potential increases in highway maintenance costs, higher emissions, and lower fuel efficiency. In addressing this problem, the State will need to distinguish between services that can be successfully subsidized, and those that no longer effectively serve the shipper market in their respective communities.

The consequences of insufficient rail capacity in the State rail system are not always an increase of truck traffic on state and local roadways. A primary justification for state involvement in the freight-rail system is that movement of cargo by rail offers public benefits as compared to trucking, especially in congested corridors. This is also a consideration in dealing with capacity conflicts between freight rail and passenger rail. However, in looking at the traffic profile

in Washington State, a substantial amount of cargo may be unlikely to divert to trucking if service and capacity continue to be a problem in the Washington State rail system. This is because of the nature of commodities shipped, costs of competing trucking service (and factors such as fuel cost and driver shortages), and the long-haul nature of many of the rail moves. In evaluating the public benefits of freight-rail capacity improvements, the State will need to distinguish between improvements that actually prevent diversion to trucking and those where the impact of lack of capacity is more likely to be higher costs and loss of competitive market position.

The planned long-range investments in the passenger rail system have potential to impact overall rail capacity (both passenger and freight) in the Washington State rail system, but they need to be more clearly linked to a system-level strategy. The existing passenger rail program is geared to addressing the specific capacity and operational issues that affect the ability to achieve the performance and ridership goals for the Amtrak Cascades service. This makes sense in the context in which the money for these programs has been appropriated. However, it would be beneficial for these improvements to be viewed in the broader context of how they address overall rail system mobility needs since improvements in the north-south corridor have impacts on the port rail system, as well as other freight-rail flows. Since current state policy authorizes the State Department of Transportation (DOT) to incrementally address needs for an effective passenger rail service in the Portland to Vancouver, BC corridor, it is often easiest to approach rail investments using the passenger program as the vehicle. In the long run, however, State investment may be able to more effectively leverage contributions from other parties (such as the ports and the Class I railroads) if the investments supporting passenger programs are more clearly linked to a strategic system-level investment strategy. This will require a more comprehensive evaluation of costs and benefits (passenger, freight-rail, and cross-modal benefits) of each investment made by the State.

4.0 Building Policy Options

4.1 POLICY OPTIONS

Based on the analysis in this report of the current and projected conditions of the Washington State economy, industry logistics patterns, the rail industry, and the rail system, the Transportation Commission can begin to develop policy options that will guide the development of rail programs for the future. The first step in this process is to gain agreement on what the objectives of these policies should be. After the policy objectives are defined, specific policy options can be developed and evaluated as to the degree to which they meet policy objectives. These policy options need to be developed in recognition of the realities of the marketplace. While it may be important (and in some cases it may be imperative) for the State to intervene in markets to achieve policy objectives, these interventions can only be successful if they occur with full understanding of what is driving the marketplace. Since most of the factors influencing the marketplace are coming from outside of Washington State, the state government needs to be careful to establish policies and approaches to their implementation that take into account the level of influence which these policies have on market behavior and business models of rail users and service providers. The State may wish to work with other entities (other states, the Federal government, business coalitions) to pursue policy goals over which it has more limited influence.

While not addressed in this interim report, the study will review and make recommendations for policy in governance of rail programs in the State. While the State DOT will continue to have a lead role in implementing state rail programs, the approach to governance needs to involve other entities, including the public port authorities, state environmental and economic development agencies, RTPOs, local economic development agencies, and possibly new entities such as rural rail districts. Rail financing may best be handled by an independent agency such as the Freight Mobility Strategic Investment Board (FMSIB). It may also be necessary to create new public-private governance compacts, especially if the State expands its role in the freight-rail system. These compacts may set clear performance expectations and service levels for all rail users of joint public-private projects. It should also be clear that in addition to the existing multistate, Federal, and binational partnerships that the State is involved in to support Amtrak services, there are likely to be a number of other multistate partnerships that Washington State should seek out to ensure that the State's rail programs are planned in recognition of the larger network issues that affect Washington State's rail issues.

The policy options that will be developed in this study will be comprehensive and strategic. The goal of establishing policy will be to ensure consistency of action that has a clear rationale in all cases covered by a policy. This will help

avoid the ad hoc approach to project and regulatory decision-making that many stakeholders complain about as characterizing the current rail program.

At this stage of the study, we put forth very preliminary ideas about policy options for consideration by the Commission. These will be refined and the rationale for the policy options will be developed in the next phase of the study. Also in the next phase of the study, an analytical framework will be developed with clear performance measures that can be used to evaluate how specific policies, programs, and projects meet policy objectives. A strong underpinning of this framework will be a benefit-cost and economic impact framework. This framework will also include clear allocation of costs and benefits amongst public and private stakeholders, local/regional and national stakeholders, and industry sectors within the private stakeholder community.

Examples of preliminary ideas about policy options that can be drawn from the conclusions of this study are presented below.

Policy #1: Rail Programs Conducted by the State Can Support Economic Growth and Competitiveness

A major objective of the state rail program is to ensure that this leg of the multi-modal transportation system is strong and can deliver services needed to support economic growth of the State, and increase the competitiveness of the State's industries and trade gateways. In order to be effective in pursuit of this objective, the State needs to seriously consider which industry sectors have the greatest potential for growth and economic success, and what business models for rail-served supply chains and logistics processes will enhance the true competitiveness of the industries (in other words what business models work in the marketplace and to what degree does controlling transportation costs and performance really improve an industry's competitive position).

As noted in numerous cases throughout the discussion of industry supply chains, industry sectors often evaluate the performance of their supply chains in terms of the velocity with which products move through the system, the reliability of the logistics system with respect to point-to-point delivery times, and ultimately the costs incurred to achieve this system performance. High velocity and reliability of supply chains means access to low-cost suppliers and high-volume markets, less risk in matching supply and demand (using more current demand information), and the ability to control inventory costs. The State's ports must continue to increase throughput, and velocity of landside transportation connections is a key component of how this is done. Railroads also achieve cost efficiencies through increased velocity, and this is a key element in their capacity planning.

The types of policies/programs that will ensure highly efficient rail systems that enhance the competitiveness of the Washington State economy could include the following:

- Support selective investment in port access and terminal capacity to eliminate critical bottlenecks in the rail intermodal network and agricultural export products rail system. These investments should be made in cooperation with the ports to ensure that adequate throughput is maintained to realize demand projection and maintain competitive status for gateway facilities.
- Provide assistance to Class I railroads in the identification, acquisition, permitting, and development of highway access to new rail intermodal terminals and transload centers. This assistance must be part of a public-private partnership agreement that demonstrates positive impact on overall system capacity.
- Support selective investment in branchline and short line systems that provide access to industrial customers with strong growth opportunities. Wherever possible, these investments should be made to meet criteria for successful carload manifest service interfaces (e.g., extension of storage track off mainlines, efficient access to storage sidings), and should be coordinated with local economic development policies to ensure that community stakeholders maintain a stake in the development.
- Provide financial assistance (credit enhancement programs, tax subsidies, or direct investment) to railroads for investment in mainline capacity improvements based on a system-level analysis of priority bottlenecks and a sequenced approach to investment that realizes real increases in system velocity.
- Develop expedited permitting procedures for private rail projects when they address priority bottlenecks and strategic capacity expansion. These permitting procedures must be developed to ensure protection of public interest and compliance with environmental and safety considerations.

Policy #2: State Rail Programs Can Support Local Economic Development

Rail access can be an important component of a local economic development strategy. In the case of many Eastern Washington State agricultural communities, agricultural shippers need low cost and efficient access to both export terminals and inland markets. In many cases, rail has historically provided this access, and loss of rail service could increase transport costs for these industries to a degree that would make them non-competitive in global and national markets. In some cases, the loss of rail service in these communities would have its biggest impact on grain storage and loading facilities.

Another aspect of rail and local economic development is the ability of rail-oriented industrial parks and transload centers to act as business attraction tools that enhance a community's economic prospects. These facilities can take advantage of existing rail access and capitalize on the transportation and locational advantages of a community.

If rail access investments are to be successful as an economic development strategy, they must be made with a clear understanding of the business models that will effectively integrate into the rail system and operational models of the Class I railroads as they are evolving. The short line and consolidation facilities that are supported need to have sufficient viable markets and the planning and implementation of the strategies must have direct local financial and management involvement.

The types of policies that could support local economic development initiatives might include:

- Provide financial support to develop transload centers and short line collection/feeder systems. These should be developed through local economic development/port districts, should involve local financial support, and should demonstrate an effective business model.

Policy #3: State Rail Programs Can Sustain Communities

It has been observed that many communities, particularly agricultural communities in Eastern Washington State, rely on rail access to markets through an increasingly vulnerable short line system. This system is largely undercapitalized, is in dire need of infrastructure upgrade and maintenance investment, and is increasingly finding its rates or revenue recovery opportunities under agreements with the Class I railroads to be financially untenable. The loss of this short line service is sure to have economic impacts on agricultural cooperatives and storage facilities that rely on these short lines to deliver business and in some instances, growers may find the costs of transportation alternatives (such as trucking to a consolidation center) to be too high for them to absorb and remain competitive.

The State could invest or provide other forms of financial support to maintain these short line services as a form of assistance to these critical local industries. However, in so doing, the State needs to be certain that the support will actually work to preserve service given the evolving operational models of the Class I railroads and agricultural shippers.

The types of programs that would support this policy objective might include the following:

- Development of regional freight-rail districts to provide support or ownership of needed short line services. The State could create these districts around market areas that have sufficient market volume to support these short line services and provide seed money in grants, or loans that would be awarded to the districts upon submission of an approved business plan. The districts could be provided with tax exempt bonding capacity and the ability to own track/equipment and to operate systems.
- Direct grants or loans to short line operators for investment in track upgrades where these operators must demonstrate a business model which shows how

the improvement will lead to defined improvement in service and must show how this will attract/retain markets that can lead to financial viability.

Policy #4: State Passenger Rail Programs Should Cost-Effectively Improve Passenger Mobility

In highly-congested corridors, removing cars and trucks from highways could be accomplished by providing more multimodal capacity, and this would reduce delay, preserve mobility alternatives, and potentially improve safety of existing highway corridors by improving operations. Investments in rail services that would address this policy objective need to be evaluated in terms of the true cost-effectiveness of the investment; that is, for each alternative, all costs including embedded subsidies, external costs, infrastructure capital costs, and costs of ownership and operation of each mode.

The types of programs/policies that would support this policy objective could include:

- Continued and expanded state sponsorship of intercity passenger services.
- Focused investment to eliminate high-priority bottlenecks in shared freight/passenger rail corridors. These investments should be made in partnership with the Class I railroads and a system of allocating costs between the public and private sectors that prices capacity improvements in relation to the value to each user should be developed.
- State purchase of new right-of-way or leasing of passenger-exclusive right-of-way within existing freight right-of-way to separate passenger and freight operations.
- Develop a rigorous analytical approach to evaluating all benefits of passenger rail investments, including an approach to evaluating freight-rail benefit that has buy in from the freight railroads.

Policy #5: State Rail Programs Should Seek to Minimize Community Impacts

Rail traffic and operations can have both positive and negative impacts on communities. Increased rail access can reduce emissions relative to trucking alternatives, and can reduce wear and tear on local roads from rail traffic that would be diverted to trucking. However, increased rail traffic can also create delay and safety issues at grade crossings, can impede development when this development requires access across existing tracks, and can increase noise in the vicinity rail corridors. The State should adopt policies that maximize community benefits and mitigate negative impacts.

The types of policies that would achieve this objective could include:

- Provide a dedicated funding source to support grade separations and clear criteria for its application.

- Require consideration of environmental and road maintenance impacts associated with diversion of rail traffic to trucking in decisions to support rail investments.
- Create a state- or multistate-level ombudsman function for negotiating conflicts with railroad industry. This would include regular meetings with corporate management to review lists of projects with community impacts, and to develop comprehensive and strategic programs to resolve issues so all sides receive some benefit from solutions.

Appendix. A Closer Look at Washington State Rail Users

A.1 MERCHANDISE TRADE AND RETAIL INDUSTRIES

Industry

Who Are the Merchandise Trade and Retail Sector Users of the Washington State Rail System and What Benefits Do They Bring to the State?

A major industry sector using the Washington State rail system is the merchandise trade and retail sector. Much of the demand for rail services from this industry sector is from out-of-state businesses that are bringing containerized consumer goods through the Washington State seaports and then moving these goods by rail to the interior U.S. In this case, the primary benefit that rail use by these industries brings to Washington State is employment/income/taxes from port-related jobs.

Washington State's seaports need good rail access to remain competitive with other North American West Coast ports. A strong rail system also supports Washington State shippers in this sector who provide transportation and distribution services (including value-added warehousing) as part of regional and national distribution networks. The existence of a healthy port system supported by an efficient rail network is critical to the success of Washington State merchandise trade and retail businesses, as it is to out-of-state businesses.

A description of who this industry is in Washington State, with an emphasis on its economic contribution to the State (including those parts of the industry that do not use the rail system), is presented in Table A.1.

The merchandise trade and retail industry is comprised of three key economic sectors: 1) wholesale trade, 2) retail trade, and 3) transportation and warehousing. Together, these sectors employ 532,000 people in Washington State, accounting for 19 percent of the State's jobs. These sectors are also major contributors to the state's overall economic growth, adding over 63,000 jobs between 1995 and 2005.

Table A.1 Washington State Industry Profile
Merchandise Trade and Retail Industries

Item	Description
NAICS codes	<ul style="list-style-type: none"> • Retail Trade (super sector) • Wholesale Trade (super sector) • Transportation and Warehousing (super sector)
Employment	<ul style="list-style-type: none"> • Retail Trade: 1995 271,600; 2005 317,500 • Wholesale Trade: 1995 = 109,200; 2005 = 122,700 • Transportation & Warehousing: 1995 = 87,600; 2005 = 91,500
Contribution to GSP	<ul style="list-style-type: none"> • Retail Trade: 1997 = \$13.5B; 2004 = \$18.9B • Wholesale Trade: 1997 = \$12.2B; 2004 = \$16.1B • Transportation and Warehousing: 1997 = \$7.9B; 2004 = \$9.9B
Trend	<ul style="list-style-type: none"> • Moderate growth, driven by economic, population, and import/export growth
Suppliers	<ul style="list-style-type: none"> • Wholesale Trade: business and professional services, real estate, communications, wholesale trade, printing, electrical equipment, auto repair, public utilities • Retail Trade: real estate, business services, communications, printing, utilities, banking, wholesale trade, food, paper
Markets	<ul style="list-style-type: none"> • Wholesale Trade: gas and oil, primary metals, fuel oil and coal, retail trade, autos and parts, exports, clothing, food and beverages • Retail Trade: Local population and businesses; nationwide reach through Internet sales and mail order
Rail impacts	<ul style="list-style-type: none"> • Rail helps lower costs of goods entering and leaving Washington State, especially long-haul products. Rail also helps Washington State's ports remain competitive for imports and exports of intermodal, automotive, and bulk goods.

Retail sales in Washington State, a reflection of the State's growing population and rising income levels, increased from \$52.5 billion in 1997 to \$65.3 billion in 2002, a gain of 24.4 percent – the same as the national rate of increase.

The growth of Washington State's wholesale trade industry was fairly strong during the 1990s as companies increased the use of outsourcing to perform wholesale trade functions that had previously been conducted in-house. Likely due to the presence of major border crossings and international ports and airports, wholesale trade is more concentrated in Washington State than the nation as a whole.

A large part of the trade and distribution industry in Washington State relates to the operation of the State's international airport and port gateways. Today, Washington State accounts for over 4 percent of the nation's exports. The value of Washington State's exports is equivalent to about 14 percent of the State's GSP, making exports twice as important to the State's economy as they are for the nation (the value of total U.S. exports is equal to 7 percent of the national economy).

Washington State ports contribute to the economy of the State by providing high wage jobs, as well as in-state local facilities for handling the State's exports. The business at the ports generates taxes for the State and the localities in which they are located. Data on the economic impact of the State's three largest ports is presented below.

Port of Tacoma

In a study released in July, 2005²⁹, the role of the Port of Tacoma in the state economy was quantified to include 113,000 jobs connected to the Port within the State, 43,100 of which are located in Pierce County. The average Port of Tacoma-related job paid \$44,951 in Washington State, while those port-related jobs in Pierce County have an average annual wage of \$48,530, 41 percent more than the county average. State and local taxes generated by Port of Tacoma activity in 2004 were \$91 million with \$13.9 million of this for Pierce County and its municipalities. The Port provides transportation services to firms across the State, including more than 1,350 Washington State firms importing or exporting through the Port of Tacoma in 2004 alone. Additional jobs are created during construction activity at the ports, of which there has been a considerable amount in recent years. The Port of Tacoma invested \$115 million in capital projects in 2004 as the first year in a 5-year, \$434-million capital development plan. It is estimated that every \$1 million in capital spending creates about 8 construction jobs in the State.

Port of Seattle

The economic impact of the seaport operations of the Port of Seattle includes jobs, payroll, and tax revenues. In the most recent economic-impact study³⁰, it was estimated that the Port of Seattle's seaport supported 34,501 jobs in 2003, produced \$2.1 billion in wages and salaries, and generated \$2.4 billion in revenue. The 34,501 jobs included 17,927 jobs directly attributable to seaport activity; 11,198 "induced" jobs that are attributable to purchases by those holding direct jobs; and 5,376 "indirect" jobs generated in the local economy. These jobs

²⁹*Port of Tacoma 2004 Economic Impact Study*, Port of Tacoma, Tacoma, Washington, July 2005.

³⁰*The Economic Impacts of the Port of Seattle*, Martin Associates, Lancaster, Pennsylvania, September 2004.

produced \$2.1 billion in wages and salaries, and \$210.8 million in state and local taxes. The Port of Seattle's seaport supports over \$431 million in local purchases.

Port of Vancouver

The Port of Vancouver is smaller than the two major Puget Sound ports, yet still has a significant economic impact on the region and the State of Washington State. An economic impact survey released in 2001³¹ for the Port showed that port maritime activities at the Port of Vancouver provide a total of over 5,500 jobs directly and indirectly related to the Port at that time. Maritime port operations generated over \$242 million in direct and indirect wages and salaries, plus a total of \$29 million in state and local taxes.

Rail service and infrastructure are crucial for maintaining or improving the competitiveness of Washington State's ports. Washington State's container ports handled nearly 3.6 million Twenty-Foot Equivalent Units (TEUs) in 2004, accounting for 17 percent of all the containers processed by the nation's Pacific ports.

What and How Much Do They Ship?

The second highest volume commodity shipped by rail in Washington State, at 10.6 million tons, were "miscellaneous mixed shipments," which consist entirely of freight moving in trailers and containers (i.e., intermodal). Intermodal traffic for which commodities are reported in the Waybill Sample amounted to another 5 million tons, such that total intermodal tonnage accounted for approximately 25 percent of all rail traffic by weight and a much larger percentage in terms of the number of rail cars moved. In 2004, 60 percent of intermodal traffic was out-bound from the State, much of it Asian imports arriving through the Puget Sound ports.

Outlook

What is the Growth Forecast for the Industry?

The Merchandise Trade and Retail industry sector has been one of the faster growing sectors in Washington State. This sector accounted for nearly 30 percent of total sales for the State in 2005, and sales have grown 4 percent annually since 2000. Global Insight's forecasts show growth easing from historical levels, but still coming in at a strong 3 percent per year over the next 5 years, and at a 3 percent compound annual growth rate over the forecast. However, the merchandise trade and retail industry sector has experienced very little job growth since 2000 and the forecast projects little change. Employment in this sector grew only 0.3 percent annually from 2000 to 2005. It is expected that employment

³¹*The Economic Impacts of the Port of Vancouver*, Martin Associates, Lancaster, Pennsylvania, February 2001.

growth will average 0.2 percent per year over the entire forecast, adding only 16,000 workers by 2025.

As noted previously, most of the demand for rail services on the Washington State rail system from this sector is driven by the global supply chains of companies serving demand all over the U.S. Therefore, it is necessary to examine the international trade trends influencing this demand in order to understand the stresses it will place on the Washington State rail system. It is expected that the growing significance of China as a producer of imports into Washington State and as a customer for U.S. exports through Washington State will continue. At the same time, traditional important overseas trade partners, such as Japan and South Korea, are losing share of trade through Washington State. By 2025, China will be the number one partner for trade with Washington State. Measured in total tons of imports and exports moving by sea, China will represent a full third of total tonnage trade (imports and exports) with the Pacific Northwest. Japan's share will fall from 34 percent in 2000 to 18 percent by 2025. The low production costs and growing middle class in China, combined with increased openness to trade following China's accession to the World Trade Organization, have combined with source-country supply shifts by importers to greatly advance the importance of China to Washington State and the entire U.S. There are downward risks to this outlook for future trade in the event of political disruptions within China, or more rapid change in protectionist trade policies and investment patterns in other developing countries, such as India. Risks to the forecast that could have the greatest impact on rail demand include increased protectionist policies that would dampen exports and imports or slower Gross Domestic Product growth that would reduce output and goods demand, and therefore demand for rail service to transport the goods.

How Will Freight Demand Increase?

The forecast for freight demand on the Washington State transportation system in the Merchandise Trade and Retail industries can be found in Table A.2. Intermodal rail shipments accounted for more than one-half of all freight demand in the industries in 2004. Close to 5.7 million tons were shipped using rail. This was also more than three times the amount shipped by rail using carload. Global Insight expects that the forecast for intermodal rail will also be greatest of all surface modes of freight. Intermodal is estimated to grow at a 7.2 percent compound annually growth rate from 2004 to 2015, and at a 5.8 percent compound annual growth rate over the forecast period. More than 18 million tons will be shipped via intermodal rail service in 2025.

Water transport had the second largest modal share of all freight demand in this sector in 2004 at 24 percent, carrying close to 2.4 million tons of freight. Truck freight is projected to have slower growth over the entire forecast period. It is expected that truck tonnage will grow 1.6 percent annually from 2004 to 2025. Compared with other transport modes, little tonnage, less than 0.01 percent of all freight in this sector, was shipped by air.

Table A.2 Freight Demand Merchandise Trade and Retail

	Merchandise Trade and Retail Sector Shipments, Tonnage by Mode		
	2004	2015	2025
Rail CL	1,441,645	2,126,731	2,651,737
Rail IMX	5,692,699	12,203,593	18,721,500
Truck	411,581	518,981	572,765
Water	2,380,810	3,017,750	3,577,904
Air	572	706	825
	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	3.6%	2.2%	2.9%
Rail IMX	7.2%	4.4%	5.8%
Truck	2.1%	1.0%	1.6%
Water	2.2%	1.7%	2.0%
Air	1.9%	1.6%	1.8%

Through Washington State container ports, cargo volumes are expected to approach 6.4 million TEUs by 2025, compared with 2.8 million in 2005. Previous forecasts released by the Ports themselves project volumes will reach 7.3 million TEU by 2025. The very rapid growth in 2004 to 2005 container volumes at the Port represents a reaction to congestion problems elsewhere along the Pacific Coast, most noticeably in Southern California. These annual growth rates are not expected to continue. The forecast for Port of Seattle reflects an estimate of the shift in some traffic down to Port of Tacoma, as expanded container terminals at Port of Tacoma (and consolidation within the steamship line industry) has resulted in some changes in vessel calling patterns.

The long-run growth in container volume continues for international traffic, with Port of Seattle, for example, having volumes reach 3.7 million TEUs by the end of the forecast period. Port of Tacoma container volume is expected to grow from just over 1 million TEUs in 2004 to 2.7 million TEUs by 2025. As most of Washington State port container volume now and through the forecast period will be destined or originating outside of Washington State, much of the volume is subject to influences outside the State. This is confirmed by experience of the last decade, first with loss of market share to Southern California ports, and recently with gains as the California gateway experienced capacity problems. Looking forward, the Ports will face new competition from Port of Vancouver, British Columbia, a new port being built specifically for North American inland container traffic at Prince Rupert, British Columbia, and “all-water” services that use the Panama Canal. The Panama Canal has announced lock expansion plans that may significantly expand the size of container ships that can use that routing, which threatens a greater shift of Asian-U.S. trade towards East Coast ports.

Continued growth in rail capacity for the container ports is critical to the forecast of volume, because the share of container trade handled through the ports that moves by rail is so high. Port rail service can be described as necessary, but not sufficient to realizing the forecast volumes. The national demand for international containerized freight handling, especially Asian trade, can be met through several alternatives, of which Washington State ports are only a part. Their recent dramatic volume growth is a reflection of the rail service advantage the ports have had providing this national gateway function. In the very long run, the container ports' volumes will reflect the combination of their success in serving their functions as a gateway for the national market and as local ports serving just Washington State. The local function serving Washington State is mostly moved to and from the Ports by truck, but it is the national demand from distribution center regions, such as around Chicago, Illinois, that are served by rail intermodal and for which there is greater competition and risk to the forecasts.

Supply Chain

How Does Their Supply Chain Work?

Businesses in the merchandise trade and retail industry sector use two different types of supply chains, depending on their product mix and their specific business model. In the first type of supply chain, the distribution supply chain type, the product will enter the supply chain either through a make-to-stock manufacturer or a re-seller, and be transported to a central warehouse or national distribution center to be stored as safety stock. Combinations of different products will then be combined in a single shipment and transported to a facing distribution center (DC) for order fulfillment in response to customer requests. The DC will then transport product to a retailer or directly to a consumer. The second supply chain type, the re-selling supply chain, will obtain product from a manufacturer through a consolidator. Products will then be shipped to a central warehouse for safety stocking, then to a stocking DC in order to stock to forecasted demand. The stocking DC will usually be operated by the retailer. Stocking DCs will ship to the retailer's facing DC for order fulfillment, and then on to the customer. The distribution supply chains have many small nodes, lots of in and out product flows, each in small quantities, and use a lot of vehicles for transport. The re-selling supply chain type generally has lots of ship-to points, lots of in and out product flows in small quantities, and contract out freight to carriers. These supply chains are carried out over global networks to take advantage of low costs of product supplies and certain value-added activities in the supply chain.

In keeping with their supply chain design, industries in the merchandise trade and retail sector emphasize flexibility, agility, and the ability to change product flows quickly in response to customer demand. They are driving towards zero stock out and rapid replenishment business strategies. These factors mean they use a lot of truck movements in their supply chains, but can also take advantage

of rail's low cost for the long-haul movements associated with geographically-dispersed supply chains.

The merchandise trade and retail sector is also looking to port diversification strategies as part of their drive for flexibility and agility. Importers have been routing more cargo through Puget Sound ports instead of California in the past two years. Two events precipitated this trend: 1) 9/11 and the resultant increase in port security legislation, and 2) the ILWU lockout in 2003. Shippers determined it was important to use a greater number of port gateways to mitigate the risk of business interruption due to events out of their control. All of the retail and consumer goods shippers interviewed for this study indicated they intend to ship more through Puget Sound ports in the next few years, primarily due to anticipated sales growth and port diversification strategies. This trend towards using more port gateways has exacerbated railroad capacity constraints in Washington State. But the competition with other West Coast ports and all-water routes is fierce with businesses moving their ports of entry rapidly in response to market conditions.

Several alternative logistics strategies are producing mixed signals that make certain aspects of port and rail planning difficult. On the one hand, retailers are positioning DCs near port gateways in order to get products into the pipeline quickly and avoid delays in long-haul components of their storage stocking process. On the other hand, some businesses in this sector are using DC bypass programs by transloading incoming cargo into shipments that can go direct to stores (in effect, the transload facility begins to look more like a DC). Each of these trends may affect the degree to which strategies like on-dock rail vs. domestic intermodal (with containers coming from a transload facility) are prominent in the intermodal rail market.

The imbalance of imports and exports at many West Coast ports also means that ocean-carriers are trying to get containers back to Asia for new loads as quickly as possible. Shippers are using transloading to take advantage of the lower port-to-port rates offered by many carriers. The logistics service providers operating in Washington State that were interviewed for this study project their transload volumes will increase in the future, which will further strain rail capacity. This could lead to a growth in domestic intermodal activity as a component of international trade or the use of inland ports. However, there is a countervailing trend. Many consumer goods importers utilize cargo consolidators at foreign origins that can load containers in a specialized manner that allows the container to move direct to store, thereby, eliminating the need to stop at a distribution center for rehandling. These containers generally move intermodally on an ocean carrier's through bill of lading. Those importers that can allocate orders early enough in the cycle prior to shipment from the foreign origin can realize great cost savings by employing distribution center bypass programs. Various value-added services are also being performed at the foreign factory and consolidator's warehouse at lower costs than what the importer could do at U.S. distribution centers. Activities could include such things as making product

floor-ready, ticketing, barcode label application and scanning, ironing, packing assortments in one carton, etc. These different trends have complicated equipment planning by railroads. BNSF has tried to standardize its intermodal trains to focus on 40-foot containers, but transloading practices can make this more difficult to achieve.

How Well Does Rail Meet the Merchandise Trade and Retail Supply Chain Needs?

Most consumer goods shippers interviewed for this study believe their rail carriers do not have sufficient capacity in terms of tracks, equipment, and personnel to meet their requirements. The most common issues cited were lack of capacity, slow velocity, and equipment and locomotive shortages. Most shippers indicated that rail service issues affect their ability to perform efficiently in terms of costs, operations, and meeting customer requirements. The most common problems include congestion and chokepoints, decreased velocity, transit time delays, and/or inconsistent transit times. Shippers in this industry sector have taken steps, however modest, to resolve or mitigate their rail services issues. Some actions include using more trucks, diverting cargo to other ports, using more all-water shipment as opposed to intermodal, and lobbying at the state and Federal levels for rail service improvements.

The Role of Rail in the Merchandise Trade and Retail Sectors

What Rail Services Do They Use?

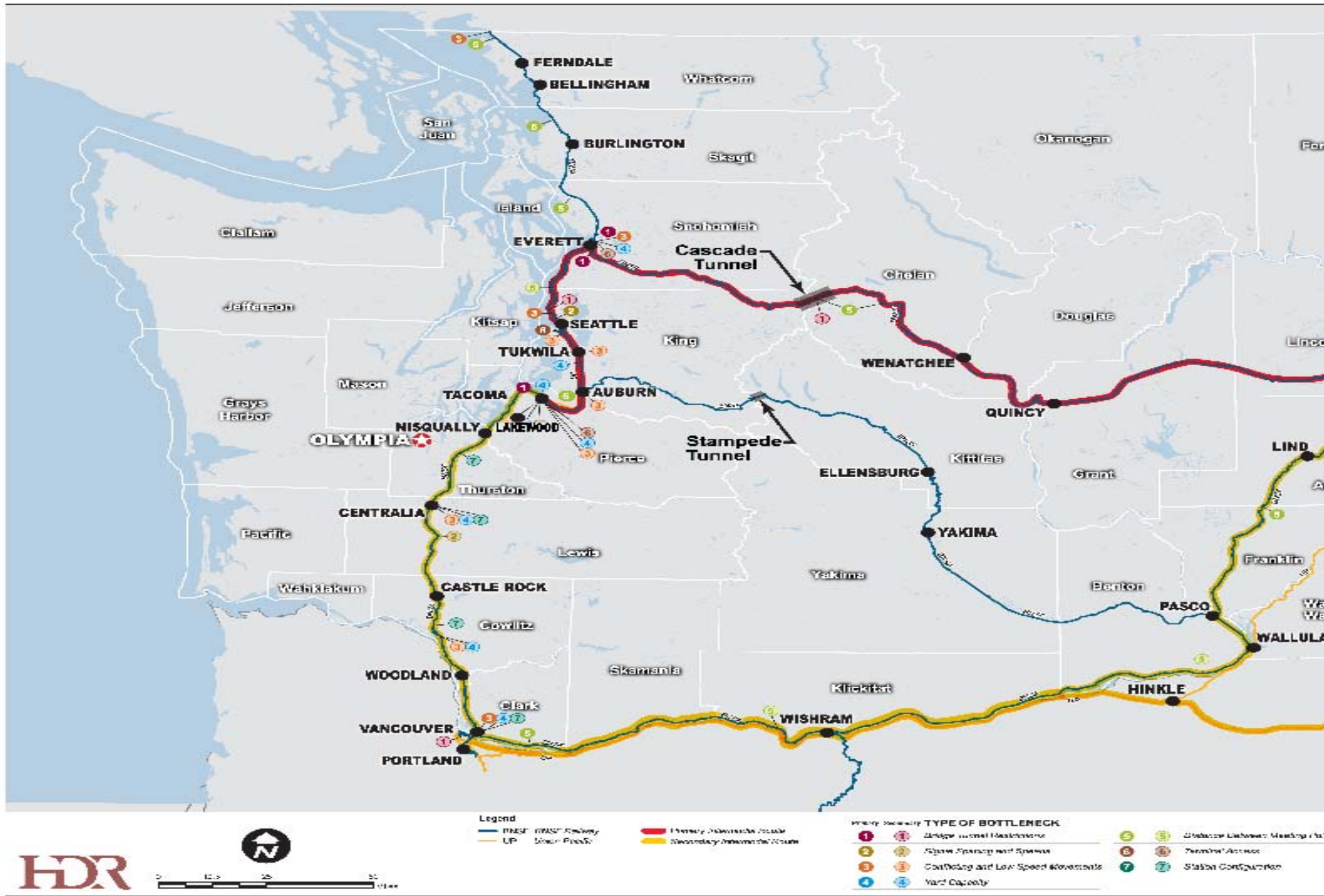
The intermodal services that are the primary rail service used in Washington State by merchandise trade and retail industries are referred to as a premium service by the railroads, meaning that customers pay a higher price and expect to receive a higher level of service. On-time performance and quick turnaround are important goals for the intermodal product. This means that intermodal trains get priority dispatching to the maximum extent possible.

Figure A.1 shows the primary intermodal routes in the Washington State rail system used by merchandise trade and retail shippers. The map also shows the location of key bottlenecks in the system that will be discussed in the next section.

BNSF domestic intermodal terminals are located in South Seattle and Spokane, Washington State, and Lake Yard in Portland, Oregon. UPRR domestic intermodal terminals are located in Argo Yard in Seattle, Washington State; and Albina and Brooklyn Yards in Portland, Oregon. International intermodal terminals are located at the Ports of Portland, Tacoma, and Seattle

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Figure A.1 Primary Routes and Bottlenecks for Merchandise Trade and Retail Sector



What Are the Key Bottlenecks?

Figure A.1 depicts the primary routes and bottlenecks for the merchandise trade and retail sectors. Approximately 70 percent of all containers are shipped out of state by rail on double-stack intermodal trains. The remaining intermodal traffic is domestic intermodal destined for or originating from Washington State's population centers, primarily in the Puget Sound region, but Spokane, Vancouver/Portland and Tri-Cities also generate domestic intermodal traffic. An increasingly large portion of domestic intermodal traffic consists of containerized municipal waste from the Puget Sound region destined for industrial landfills located in eastern Oregon and eastern Washington State (see section on manufacturing and industrial products sector for a discussion of rail issues related to municipal solid waste transport).

The international trade-oriented intermodal rail system is comprised of a number of key components, which must all function smoothly in order for the system to work. Defining priority bottlenecks involves a process of determining capacity constraints that are the limiting constraint in a series of connected system elements. As each of these priority bottlenecks is eliminated in order, the end-to-end capacity of intermodal routes will increase accordingly. An overview of the elements of this system is described below, and then a more detailed presentation of capacity constraints and issues is provided for each system element.

International containers are unloaded at port marine terminals and moved to on-dock or near-dock intermodal rail yards. Intermodal rail yards consist of both loading/unloading tracks and staging support tracks. Containers are loaded onto double-stack intermodal railcars, assembled into trains, and then moved to the main line when the scheduled slot for each train is available. The primary destinations for Pacific Northwest intermodal traffic are the large population centers of the Midwest and Eastern seaboard.

Once these intermodal trains leave the Pacific Northwest, they must traverse some of the most heavily used rail lines in the nation sharing limited capacity with Powder River Basin coal trains, Midwest grain trains, and petrochemical trains from the Gulf Coast. The railroads have focused improving capacity on these heavily traveled lines, because these bottlenecks negatively impact traffic flows across their entire networks.

Marine Intermodal Terminals and Terminal Access

The Port of Seattle's Harbor Rail Study determined that its marine terminals could process up to 8,000 TEUs per acre giving the Port of Seattle's marine terminals an estimated capacity of over 6 million TEUs annually. The Port of Tacoma estimates, when fully built out its marine terminals, could process over 10 million TEUs annually. No marine intermodal bottlenecks have been identified that adversely affect current operations or future demand projections.

Seattle Intermodal Rail Yards include Terminal 5 and Terminal 18, served jointly by the UPRR and the BNSF; Seattle International Gateway (SIG), served by the

BNSF; and Argo served by the Union Pacific Railroad. The Port's capacity is directly limited by the lift capacity of the intermodal rail yards. The Port and the Railroad's ability to increase the capacity of the existing intermodal rail yards is constrained by a combination of short stub-ended intermodal tracks, short arrival and departure tracks, short switching leads crossing busy streets at-grade, low speed train movements, short staging tracks, limited ability to move cars between intermodal and staging yards, and dense urban development surrounding their facilities. Identified capacity constraints include the following:

- Argo Yard is currently operating at capacity with crews working 24 hours a day, 7 days a week. The facility handles domestic intermodal trailers and containers, solid waste containers, municipal solid waste transfer facility, as well as Port-generated containers. Expansion of the loading/unloading tracks would require replacement of all or part of the First and Fourth Avenue overpasses. Extensions of the loading tracks are constrained by East Marginal Way to the west and BNSF mainline to the east. The Union Pacific Railroad is considering discontinuing its domestic intermodal operations and relocating its municipal solid waste operations to increase its international container capacity at Argo.
- SIG and Stacy Street Yard is the primary location of BNSF's intermodal operations in Seattle. The Stacy Street Yard is bound by Alaskan Way Viaduct to the west, South Hanford Street to the south, South Atlantic Street to the north, and Utah Avenue South to the east. The tracks (leads) located on the north and south ends of the Yard are used to arrive and depart trains and switch railcars. The leads to SIG and Stacy Street Yard are not grade separated from cross streets, thereby, causing rail switching plus train arrival and departure activities to block street crossings negatively affecting freight mobility for the Port, railroads, and local businesses. SIG is split by Stacy Street Yard into two yards: Main SIG and SIG North. The yard is nearing its capacity limit. To increase capacity, the BNSF is redeveloping SIG North into a European style rail yard that will use electrically-powered Wide Span Gantry Cranes (WSGs) to lift containers to and from railcars and trucks.
- Port of Seattle T-18 loading tracks are too short to efficiently arrive and depart trains. Its loading track area is better used as a container yard.

There are a number of critical capacity issues affecting Seattle terminal access. These include the following:

- **Duwamish Corridor** – Recent capacity studies performed by the Port of Seattle indicate that there is sufficient main capacity between the intermodal rail terminals and the main line to meet projected demands provided the minor Duwamish corridor access improvements are implemented, as well as joint operations on the corridor for Union Pacific and BNSF trains. Currently, UPRR trains accessing Terminal 5 must run through Argo Yard, impacting yard switching operations.

- **At-grade crossing of East Marginal Way at Spokane Street** – Long trains leaving Terminal 5 block the road crossing limiting truck access to Argo and SIG intermodal yards.
- **Speed restriction at Coach Wye** – Seattle Terminal access is further restricted by a 10 mph speed restriction around the Coach Wye. All BNSF intermodal trains leaving the Port of Seattle currently use the Coach Wye.

The Port of Tacoma has developed a series of on-dock intermodal rail yards to serve each of their marine terminals. They include the North Intermodal Yard (NIM), South Intermodal Yard (SIM), Washington United Terminal (WUT), and the Pierce County Terminal (PCT). The Port is currently developing plans for a new mega marine intermodal terminal along the east Blair waterway. The Port is also performing operational simulations to determine the optimum size and configuration of its intermodal rail yards required to support the new and expanded marine terminals. Unlike the Port of Seattle, the Port of Tacoma is not constrained by the lift capacity of the existing intermodal rail yards, but by the configuration of the Tacoma Tideflats terminal track and yard tracks. Identified capacity constraints include the following:

- **Chilcote Junction** – The crossing point for all trains from the stub-ended WUT and PCT intermodal yards, the Banana Yards staging support tracks, and the arrival and departure tracks.
- **Bullfrog Junction** – The single-track access point to all Tacoma Tideflats yards and terminals. BNSF trains entering the junction from the west must cross UPRR trains entering the junction from the south.

As in the case of the Port of Seattle, the Port of Tacoma also has terminal access issues. Recent capacity studies performed by the Port of Tacoma indicate there are significant capacity issues for trains accessing the Port from the UPRR and BNSF main lines. Currently, UPRR trains arrive through Reservation Junction from the south to Fife Yard. The train sets on the main line blocking all switching activity at the yard until a Tacoma Rail switch crew pulls the train north through Bullfrog Junction. Similarly, BNSF trains arriving from the north must stop on the main line, switch the power to the other end of the train, and pull it through Bullfrog Junction from the east. If a main line track is not available, the BNSF pulls the train into its log yard breaking it into two sections. The train must be reassembled before it is moved to the Port. All trains leaving the Port must perform the same procedures in reverse.

Railroad Main Lines

There are capacity issues on many segments of the railroad main lines serving the merchandise trade and retail sectors. Main line capacity constraints between Seattle and Everett include the following:

- **South Portal – MP 8 (Ballard)** – The speed limit in the tunnel between South Portal and North Portal is 20 mph. There are no intermediate signals

between South Portal and North Portal, resulting in a signal block length of about 1.6 miles.

- **Galer Street – MP 5.4** – This single-track segment poses a significant capacity limitation of 48 trains per day. There is a minimum delay of 17 minutes at Galer Street when the line is operating at capacity.
- **Ballard Bridge** is open for marine navigation and trains are restricted to 20 mph across the bridge.
- **Edmonds single track between MP 16 and MP 18** has excess capacity (144 TPD); however, trains at this location routinely experience delays of 3 minutes when the line is operating at capacity (45 TPD).
- **Maintenance Access Interbay – Everett Junction** – This segment of track has limited roadway access requiring maintenance of way vehicles to occupy one of the two main tracks when performing maintenance.
- **Single-Track Operation Interbay – Everett Junction** – Overtaking moves can normally be made on this segment of track. However, if overtake meets are not coordinated properly, resulting train delays may be extensive.
- **Everett Junction – PA Junction** – The 2.5 miles of single track between PA Junction and Everett Junction, and the 25 mph speed limit limits the capacity of the entire line to 45 TPD.

Main line capacity constraints between Everett and Spokane include:

- **Running times between sidings over Stevens Pass from Skykomish to Leavenworth Stevens Pass** restrict the capacity of the line. Equipment is also a limiting factor because of the severity of the grade. Running time between sidings can vary considerably depending upon the number of locomotives and their horsepower.
- **Relatively short sidings at Lyons, Espanola, and Edwall, all less than 8,000 feet long.** When trains of more than 7,400 feet are considered, the capacity between Bluestem and Latah Junction is 24 trains per day. For trains of over 7,500 feet, the capacity is 18 trains per day.

Issues and Opportunities

The Merchandise Trade and Retail Sector Faces Critical Capacity Shortages

As pointed out in the discussion of current capacity and future train volumes, the merchandise trade system faces critical capacity shortages on a number of routes. To the extent that state policy is adopted that recognizes a state role in supporting this trade (both domestic and international) but that primary benefits of resolving these capacity shortages will accrue to private businesses, the appropriate state role will need to be determined. Ultimately, the decision about state role will consider costs and benefits of different options, as well as the allocation of benefits among all stakeholders. That analysis will be conducted later in the

study. At this point, however, it is appropriate to point out some potential roles the state might play.

The State could make port terminal/access or main line capacity investment. Since the ports involved in the international trade component of this industry sector's needs are public institutions serving state interests in promoting commerce and economic development, a point of intervention that could be justified would be some state investment or financial assistance to improve port rail terminals and rail access. The case for investment in main line capacity in critical corridors is a harder case to make, because these are strictly private facilities with private users. The state may not even have the authority to do much of this type of investing under current law. And main line capacity investment is expensive.

If the State does get involved in main line capacity investments, a question that should be resolved is whether or not it makes sense to continue the investment in the north-south corridor between Seattle and Vancouver, WA (which can be justified in terms of benefits to passenger rail and which is a corridor within which both railroads operate), or whether a more cost-effective approach would be to invest in an east-west corridor that represents an alternative to directing more traffic onto the Columbia River Gorge main line via the north-south corridor. An obvious example would be a public-private project to improve the Stampede Pass tunnel to allow for double-stack operations. The issue for this type of alternative investment is that, in most cases, such alternatives would benefit one railroad and not the other, impacting existing competitive relationships and the opportunity for the state to invest in this type of project may be restricted by law.

A final option would be for the state to play no role in assisting this type of capacity expansion. The argument against a state role is that the ports, the Class I railroads, and railroad customers are the beneficiaries of many of these types of investments, and each has their own capital pool from which to pay for the projects.

Rail Improvements Are Needed to Ensure Competitiveness and Preserve Jobs at the Ports

This report has identified the role that the international trade-oriented seaports play in the economy of Washington State and why the continued economic health of these vital public assets is beneficial to the State. Given current capacities and projected trade growth, there are likely to be capacity shortfalls and there is an economic stake that the State (as well as the Ports themselves and the private sector) has in this outcome. So, the investments in terminal access and main line capacity, described as an issue above, could potentially be justified based on this public interest.

An important component of the analysis of this issue needs to be the extent to which there should be a Federal government role in supporting these investments. The justification for this role would be the benefits to the U.S. economy of supporting efficient trade with other Pacific Rim countries, and the degree to

which the costs of this trade would be made higher by lack of investment or diversion to other ports (either in the U.S. or elsewhere in North America).

Control Cost of Distribution in the PNW

The Pacific Northwest region is somewhat geographically isolated from major domestic trading partner regions, and the region has major concentrations of regional and national distribution facilities that bring economic benefit to the communities in which these distribution facilities are located. This may be less of an issue for Washington State than for Oregon (Oregon has a higher than national average fraction of total employment in distribution businesses). Nonetheless, an active and healthy rail system that supports the merchandise trade and retail sector does lower overall transportation costs to serve domestic and international trade in the region. To the extent that this satisfies an economic policy objective of Washington State, it will justify investment or support to capacity improvements to the systems supporting this sector.

A.2 AGRICULTURE AND FOODS PRODUCTS INDUSTRIES

Industry

Who Are the Agriculture and Foods Products Industry Users of the Washington State Rail System?

In terms of total tonnage shipped on the Washington State rail system, agricultural and food products represent the largest industry sector using the system. As was the case of the merchandise trade and retail industry sector, the majority of product shipped by this industry sector is by businesses outside of the State. Agricultural exports, primarily grains, from the midwestern U.S. bound for Columbia River ports are a major user of the Washington State rail system. However, the Washington State rail system has also played an historically important role for Washington State shippers in this industry sector. Eastern Washington State's agricultural shippers have used the system for connections to export ports, as well as to transport product to domestic markets. In recent years, growth of the Columbia Valley wine industry has represented a new market for rail. And the rail system also brings food products from elsewhere in the U.S. to Washington State consumers.

A profile of the industry and its economic contributions to Washington State are presented in Table A.3.

Table A.3 Washington State Industry Profile
Agriculture and Food

Item	Description
NAICS codes:	<ul style="list-style-type: none"> • Food: 311 – Food Manufacturing • Agriculture: 111 – Crop Production; 112 – Animal Production
Employment	<ul style="list-style-type: none"> • Food: 1995 = 39,800; 2005 = 33,900 • Agriculture: 1994 = 77,698; 2004 = 81,581
Contribution to GSP	<ul style="list-style-type: none"> • Food: 1994 = \$3.2B; 2004 = \$4.9B • Agriculture: 1993 = \$2.5 billion; 2003 = \$2.6 billion
Trend	<ul style="list-style-type: none"> • Food: Steady growth tied to population growth • Agriculture: Steady; products market value was \$3.8B in 1992 and \$5.3B in 2002
Suppliers	<ul style="list-style-type: none"> • Food: Farms, food products, wholesale trade, paper, fabricated metals, rubber, business services, trucking, printing, glass, public utilities • Agriculture: Farms, food, real estate, agricultural services, chemicals, wholesale trade, trucking, petroleum products, public utilities, auto repair
Markets	<ul style="list-style-type: none"> • Food: Eating and drinking establishments, retail trade, food products, farms, hotels, exports, amusement and recreation • Agriculture: Food products, farms, tobacco manufacturing, textiles, exports, wholesale and retail trade, eating and drinking establishments
Rail impacts	<ul style="list-style-type: none"> • Offers lower cost transportation service making Washington State products (such as wheat and fruits) competitive against foreign imports.

Agriculture and food are two interrelated industries. “Agriculture” represents the growing of crops (e.g., wheat, apples, etc.) and the raising of livestock, while “food” represents the manufacture of the items commonly found on grocery store shelves (e.g., bread, juice, cheese, meat, soda, pasta, etc.) other than fresh produce.

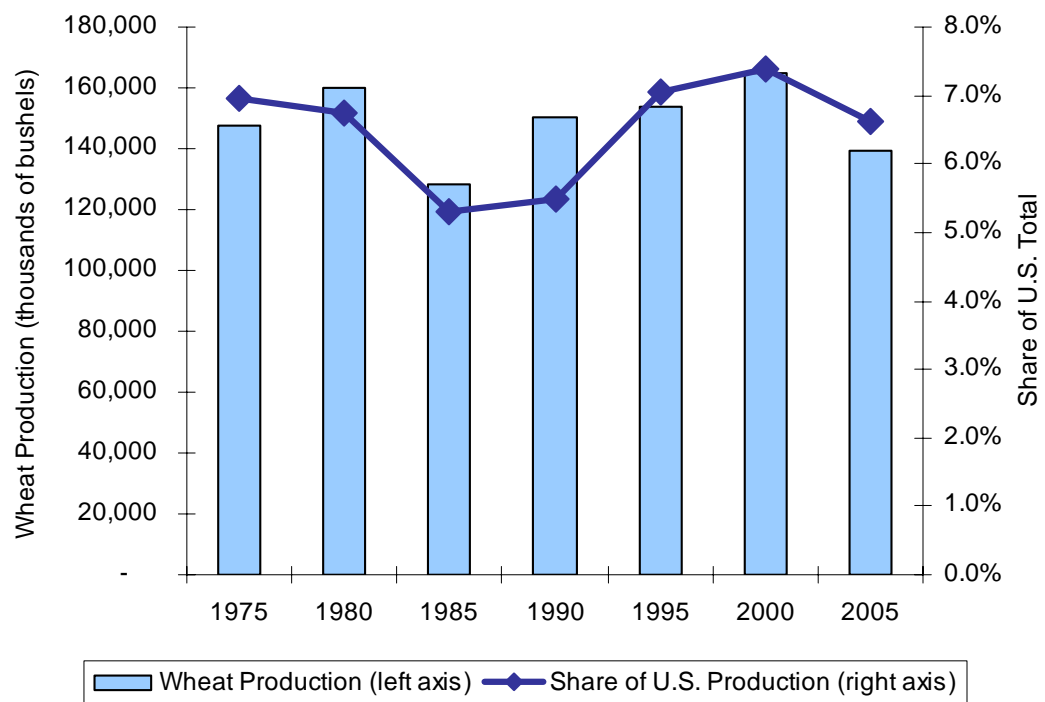
Washington State’s agriculture industry is the 11th largest in the country, producing crops and livestock valued at \$5.3 billion in 2002. While livestock sales reached some \$1.7 billion in 2002, Washington State’s agriculture industry, based on value, is distinguished by its crop production (e.g., wheat, apples, pears, berries, grapes). In 2002, the value of crops grown in Washington State reached \$3.6 billion, ranking the State seventh in the country.

The diversity in Washington State’s agricultural industry can be found in both variety of crops and in the differences between eastern and western Washington

State. The larger farms can be found on the east, those which produce grains, fruits, and vegetables. On the smaller farms of the west, production comes from dairy, poultry, and berries.³²

Wheat. Generally growing 140 million to 160 million bushels per year (see Figure A.2), Washington State is the fifth largest producer of wheat in the United States, trailing only Kansas, North Dakota, Montana, and Oklahoma. Washington State's yield, however, 63 bushels per acre, is more than 50 percent higher than each of these competitors. Eastern Washington State is one of the most productive wheat growing regions in the country, and four of the State's counties (Whitman, Lincoln, Walla Walla, and Adams) rank among the nation's top 10 counties in wheat production. Washington State wheat growers must make continuous efforts to improve yields and control costs as they face formidable competition from Argentina, Australia, Canada, and the European Union. Rail plays a critical role in controlling costs by providing an inexpensive option for transporting Washington State's wheat to West Coast seaports for export.

Figure A.2 Washington State Wheat Production
1975 to 2005



Source: U.S. Department of Agriculture.

³²*Agricultural Lands – Introduction*, Municipal Research and Services Center of Washington, May 2003, <http://www.mrsc.org/subject/planning/aglands.aspx>.

Apples and pears – Washington State’s agriculture industry is perhaps best known for its apple and pear production. In 2002, the State grew 5.1 billion pounds of apples, accounting for three-fifths of the U.S. harvest. Washington State also produces about 800 million pounds of pears per year, about one-half of the U.S. total. Apple production in Washington State has gradually increased since 1987 and is concentrated in the Yakima and Wenatchee valleys in the central part of the State. In recent years, between one-fifth and one-third of Washington State apples have been exported. Leading markets include Canada, Mexico, Taiwan, Indonesia, and Hong Kong. Tariffs and other restrictions have prevented Washington State from tapping the lucrative Japanese market. Worldwide, Washington State apples face competition from New Zealand, Chile, the European Union, and South Africa. In the future, China will become more of a competitor, following efforts to upgrade its apple industry to western standards of quality, safety, and packaging.

The growing public health emphasis being placed on eating fresh fruits and vegetables bodes well for Washington State’s leading crops, including raspberries, cranberries, grapes, and cherries, as well as apples and pears.

Freight rail and Amtrak are used to transport Washington State apples and other produce to destinations throughout the United States, particularly to the East Coast.

Food products – The value of Washington State’s food products output reached \$10.9 billion in 2004, ranking 20th among the states. Washington State’s output of manufactured foods grew substantially faster than the U.S. average between 1994 and 2004 (28 percent versus 19 percent). Within the food industry, Washington State’s particular strength is in frozen food manufacturing, accounting for 7.3 percent of U.S. output. Production of food in Washington State is increasing, even as job levels decline, reflecting increased productivity and the greater use of outsourcing (e.g., administrative functions shifting to specialized companies, rather than being performed in-house).

Wine production – Recognized worldwide for its quality, Washington State has emerged as the second largest producer of wine in the United States, following California. Acreage devoted to vineyards grew from 11,100 in 1993 to 29,000 in 2003, while production doubled over the same period to 17 million gallons. Vineyards are located throughout the State, but are most concentrated in the central and south-central regions, in or nearby the Columbia River Valley.

Outlook

What Is the Growth Forecast for the Industry?

Washington State, as the largest agricultural producer in the Northwest, has relied on freight transportation to serve the farming and food processing sector for many years. The outlook for this sector is for a decline in the coming years. In the 5-year period, from 2000 to 2005, total sales in this sector grew at a

3.6 percent compound annual growth rate, and now stand at \$33 billion for 2005. The weaker growth outlook is for growth to ease to 0.7 percent per year in the next five years, and 0.2 percent annually from 2005 to 2025.

Employment in this sector is expected to decrease over the entire forecast period. Historically, employment in this sector declined 1.7 percent annually from close to 130,000 in 2000 to 119,000 jobs in 2005. Employment is projected to decline near 1.0 percent per year over the entire forecast to just under 100,000 workers by 2025.

Washington State's agricultural and food processing industries once greatly benefited from a number of advantages in location relative to Asian markets, as well as in lower energy (hydropower from dams) and water costs. The forecasts in this report, prepared by Global Insight, are based to some extent on the assumption that low water costs are a thing of the past. However, recent water rights agreements, signed by the Governor, may allow for continued increase in farm productivity that would allow for growth in this sector. Increased competition from Asian producers, however, has also hurt agriculture in the State. Washington State has also felt the strain of a lower supply of low-cost labor.

How Will Freight Demand Increase?

The forecast for freight demand in the Agriculture and Food Products industries can be found in Table A.4. Truck has the highest mode percentage of all freight types and can expect the largest growth over the forecast period. Truckers hauled slightly more 57 million tons, or slightly more than 60 percent, of all freight in 2004. Truck freight tonnage is forecast to grow 2.4 percent annually from 2004 to 2015, and 2.2 percent annually over the entire forecast to 2025.

More than 34 million tons of freight were shipped by carload rail service, nearly 36 percent of all freight tons. Carload rail also comprised 99 percent of all rail traffic tons. It is expected that rail carload demand will increase 1.2 percent per year to 2015 before easing to 0.7 percent per year growth from 2015 to 2025. It should be noted, however, that the majority of this tonnage is out-of-state shipments to Washington State ports for export.

Air cargo represents the smallest percentage of all mode freight tonnage demand in 2004, and will continue to be the least tonnage over the forecast. Air accounted for 143,754 tons, only 0.2 percent of all freight demand in Washington State. Air cargo shipments are usually the lowest weight, highest value of all shipments.

Table A.4 Table 1 Freight Demand Agriculture and Food Products
Tons and Compound Annual Growth Rates to 2025

	Agriculture and Food Products Sector Shipments, Tonnage by Mode		
	2004	2015	2025
Rail CL	34,000,324	38,666,050	41,318,807
Rail IMX	364,075	466,687	533,750
Truck	57,113,874	74,103,242	91,058,893
Water	3,507,853	4,013,971	4,458,500
Air	143,754	168,608	191,584
	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	1.2%	0.7%	0.9%
Rail IMX	2.3%	1.4%	1.8%
Truck	2.4%	2.1%	2.2%
Water	1.2%	1.1%	1.1%
Air	1.5%	1.3%	1.4%

Supply Chain

How Does Their Supply Chain Work?

The agricultural and food products industry sectors use two principal supply chain types that are interrelated: 1) extraction and 2) make-to-stock manufacturing. The extraction supply chain type applies to the agricultural products that are the dominant component of total tonnage shipped. In this supply chain type, farms produce product that is harvested and shipped to intermediate storage locations. These include grain elevators, cold storage, and other types of product storage and marketing facilities. These marketing outlets play a critical role in the supply chain and are often responsible for arranging transportation to the end of this supply chain. Product is often moved from the storage sites to other storage locations and transport terminals (ports or rail facilities) by rail or by barge. The new business models of railroads have emphasized the use of higher capacity consolidating storage facilities. This allows for economies of scale in transport and handling, and allows certain products, like grains, to be sorted before loading so that at the export facilities the product can be loaded directly to ships (saving time and cost). However, this type of consolidation could drive smaller grain elevators and storage sites out of the market, because they will not be able to get attractive rates and service from the Class I railroads. Bulk

transport often characterizes these transport stages. Extraction supply chains have few sites, use a lot of heavy equipment, and operate in commodity businesses. The make-to-stock supply chain type moves from extraction (farm) or storage sites to manufacturing facilities where the food is processed, and then to storage warehouses where it is stocked until orders are made. The businesses generally have many sites, have a lot of in and out product flows, and use as much labor as machinery and equipment. The extraction supply chain type looks to high asset utilization and low cost in transport options; whereas, the make-to-stock supply chain type looks to low transport cost, reliability of service, and transit time as key performance measures for the supply chain.

How Well Does Rail Work in Their Supply Chain?

Washington State shippers in these industry sectors are experiencing the pains of transition to a new business model, but even recognizing these issues, shippers have many complaints about current rail service. Some shippers interviewed feel powerless to affect improvements in rail service quality, and often describe themselves as “captive” to the railroads. Yet others have taken some steps to mitigate rail service issues. This includes purchasing their own equipment, or looking at alternative transportation modes.

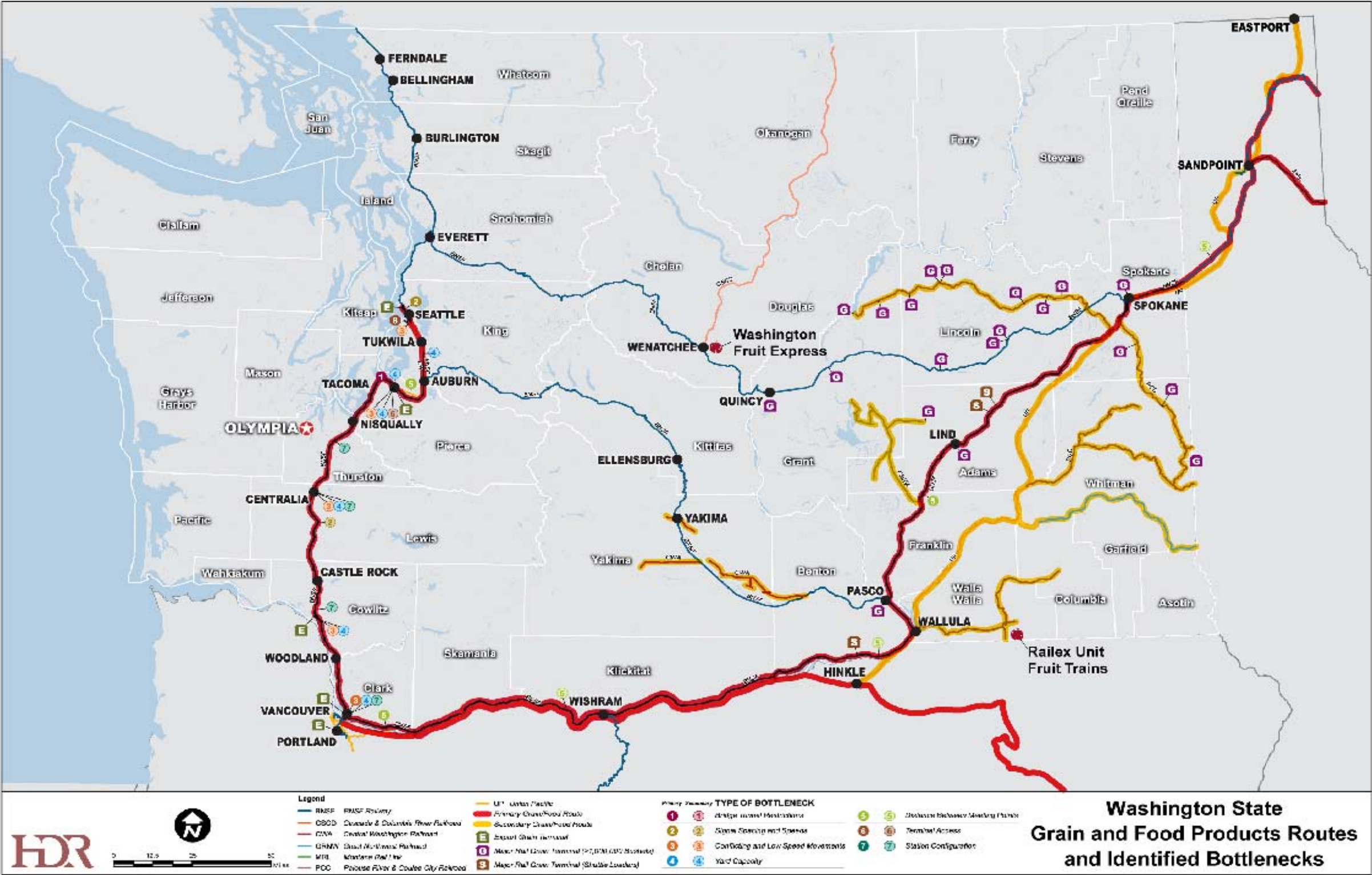
The Role of Rail in the Agricultural and Food Products Sector

What Rail Services Do They Use?

Rail has traditionally played an important role, particularly in the agricultural products sector. Both industry sectors use carload manifest services, but increasingly, the railroads are encouraging unit trains (grain shuttles), and this model has been adopted widely by the Midwestern shippers using Columbia River export ports. Washington State agricultural shippers are also switching to this model to a limited extent, and the BNSF points to an increase in its share of Washington State originated export shipments from 8 percent to 22 percent through the use of the Ritzville loader, a new consolidation facility in Eastern Washington State.

Figure A.3 provides a map of the major main line routes used for agricultural and food product shipments and associated bottlenecks. The UPRR’s primary grain route is its main lines from Hinkle to Portland Oregon, and then north on BNSF’s main line to grain elevators in Vancouver, Kalama, and Longview. UPRR also interchanges unit grain trains with Canadian Pacific railroad (CP) at Eastport, Idaho. These trains move on UPRR track from Eastport, Idaho through Sand Point, Idaho to Napa Street in Spokane, where they operate over BNSF track south to Fishtrap Junction. From Fishtrap Junction, they run on UPRR track to Wallula, and then east to Vancouver. BNSF’s primary grain route is from Spokane south to Pasco, and then along the Columbia River to Vancouver

Figure A.3 Map of Major Main Line Routes Used for Agricultural and Food Product Shipments and Associated Bottlenecks



Junction. The trains then move north to export grain elevators located in Vancouver, Kalama, Longview, Tacoma, and Seattle. Washington State-produced grain moved by rail is loaded into grain cars at various small grain elevators located on the light-density rail lines throughout Eastern Washington State. Loaded grain trains use the Columbia River Gorge route, because these heavy trains would require too much power to transit the mountains. Empty returns do use the northern mountain routes.

As can be seen on the map, short line railroads are also a critical component of the agricultural products rail system providing access to the main lines from the more remote farm areas. Grain elevators line many of these short lines and the relationship between the elevators and the short lines is critical to their mutual success. The financial problems that each of these types of businesses have faced, as the market transitions and service levels have declined on many of the short lines (due to limited capital for track maintenance and low market volumes), have made it hard for this system to meet financial performance goals.

What Are the Key Bottlenecks?

Figure A.3 presents the key bottlenecks in the agricultural and food products rail routes, identifying the type of bottleneck and the severity of the bottleneck as a capacity limiter. Identified main line capacity constraints within Washington State include the following:

- Siding lengths along the Columbia River between Pasco and Wishram, limiting train lengths to 7,000 feet. If longer trains are run, capacity is significantly reduced.
- Siding spacing between Wishram and Vancouver restricting trains to 20 minute headways, limiting capacity.
- Low-speed train operations (10 mph) through Vancouver can block the Portland-Seattle main tracks for extended periods; trains stopping on the main tracks to change train crews.
- Short yard tracks at Vancouver Yard require trains to block a main track when arriving or departing the yard, or when trains need to stop to set out and pick smaller cuts of cars at the yard.
- Grain trains accessing the Port of Vancouver must cross the BNSF main tracks at 10 mph.
- Limited access to the grain elevators, short yard tracks, and limited yard and unloading track capacity at Kalama and Longview requires trains to stop on the main tracks for extended periods.
- Centralia BNSF currently interchanges trains (changes crews) with Puget Sound Pacific on the main line. Movement to and from the main line is restricted to 10 mph blocking one of the two tracks for significant periods.

- Short lead tracks at the Port of Seattle's Cargill grain elevator require trains to block a main track when arriving or departing the grain elevator.
- Limited capacity on UPRR tracks between Wallula, Washington State and Sandpoint, Idaho from inadequate siding spacing and lengths.

Additional identified constraints that impact Washington State grain producers include the following:

- Inadequate track maintenance on low-density short lines result in low operating speeds increasing operating costs and decreasing service reliability.
- Poor service levels on low-density short lines due to low car volumes dispersed over a large geographical area.
- Carload volumes generated by shippers fluctuate seasonally reducing the ability of short line operators to operate efficiently.
- Non-unit train volumes and shorter haul distances make the business less attractive and profitable for Class I railroads.
- Competition for main line capacity with higher revenue producing trains (such as intermodal trains).
- Competition with Class I railroads from high-speed grain loading elevators constructed adjacent to their main lines like the one recently constructed by BNSF in Ritzville, Washington State. Dedicated shuttle trains service the facility reducing equipment needs. The new more efficient facility has drained traffic from the state-owned Palouse Coulee City Railroad (PCC).
- Competition from load centering operations, such as RailEx, which guarantees Class I railroad's point-to-point operations at attractive rates.

These last two constraints, while problems for certain shippers, smaller grain elevator operations, and short lines may represent cost saving opportunities for some Washington State agricultural producers.

Other agricultural products shipped by rail including apples/fruits and potatoes/onions face similar problems as grain shipper:

- Low volumes that fluctuate seasonally;
- Seasonal shortages of refrigerated railcar;
- Aging refrigerated railcar fleet;
- Competition for main line capacity with higher revenue producing trains; and
- Poor service levels and high shipping costs from light density rail lines.

Issues and Opportunities

There are a number of key issues that the State needs to be attentive to affecting agricultural and food products industries.

Current use of the Columbia River Gorge corridor for intermodal service (due to E-W capacity constraints) creates operational/capacity conflicts on agricultural routes. As noted in the discussion of the merchandise trade and retail sector, the primary intermodal route for BNSF is the Stevens Pass route. This is a route that has serious capacity constraints. While BNSF has re-opened Stampede Pass to help meet growing demand, it has its own constraints. Thus, much of BNSF's intermodal traffic out of the Ports of Seattle and Tacoma is routed south through the north-south corridor onto the Columbia River Gorge route. This creates conflicting claims on the capacity in the north-south corridor and conflicts with grain traffic on the Gorge route.

The changing Class I business model may impact the competitiveness of Washington State agriculture. This is a major concern in Eastern Washington State, and there are conflicting "facts" regarding the options and impacts. The current model that is moving towards unit trains and larger, high-speed grain loading facilities is threatening the viability of short lines, pushing more of the rural traffic onto trucks as the only way to get to consolidation facilities. This adds cost to the shipment. Even though the costs may be relatively small, the international agricultural products markets are so competitive that pennies on the move can make the difference with respect to market position.

A big question that needs to be faced in the discussion of policy to deal with this issue is whether it is possible for the Eastern Washington State agricultural system to successfully transition to a model with greater consolidation (subterminals on short lines or other types of collector systems involving the short lines) that takes advantage of pricing incentives offered by the Class I's and the potential efficiencies in loading and unloading at the Ports that are associated with the unit train model. If so, the pathway to getting there might involve state subsidies to shippers, short lines, or consolidators to keep Washington State agriculture competitive through low cost transportation. Presumably, after the system is converted to the new model, these subsidies could be withdrawn (although removal of subsidies after the fact can be difficult politically). Alternatively, the shift to a new business model by the railroads might lead to longer-term economic restructuring of Eastern Washington State communities with a decline in agriculture, because small shippers are not able to adapt to a new business model. These questions and alternative futures need to be explored as part of the determination of an appropriate state role. There is an opportunity that could develop in this new business environment to take advantage of the business model of the Class I's. Shipment consolidation facilities and unit train operations developed by third parties, such as the RailEx service, are viable alternatives, and public support to these types of ventures may be an effective strategy for preserving public benefits associated with rail service.

As noted previously, it may turn out not to be agricultural producers who are the big "losers" of the transition to a model that involves greater shipment consolidation; rather it may be small elevator operators. The State will need to under-

stand the true impact of these changes on specific sectors within the agricultural production industry.

A systematic and consistent approach will need to be adopted for determining how to support short lines and agricultural shippers. This will require a more comprehensive and periodic assessment of the markets for rail services (potential market volumes, shipment frequencies, and service needs) to determine where short line services can succeed given current business conditions. Where public assistance will make the difference, public costs and benefits should form the basis for making the decision. The State already has a cost-benefit framework for evaluating the potential public benefits of preserving rail service, and that takes into account highway costs that will be incurred if rail service is abandoned. Both the specific approach to analysis and the way that the decision support framework is actually applied to funding decisions will be reviewed in the next phase of this study.

A.3 MANUFACTURING AND INDUSTRIAL PRODUCTS INDUSTRIES

Industry

Who Are the Manufacturing and Industrial Products Sector Users of the Washington State Rail System and What Benefits Do They Bring to the State?

Manufacturing and industrial products industries are some of the largest rail using sectors among Washington State businesses and they use traditional carload manifest services. Both Class I railroads see continued growth in these sectors, and short line carriers nationally have also experienced substantial growth in shipments of carload commodities in this category. In Washington State shippers in industries including transportation equipment, chemicals, and pulp and paper products, have produced much of the volume (lumber and wood products are treated separately in the next section.). This sector also includes two specialty commodity categories, waste and scrap materials and military shipments.

The industry sectors and their economic contributions to the State are presented Table A.5.

Manufacturing provides jobs to 272,000 people and accounts for about 9 percent of Washington State's gross state product. Although the industry has experienced a long-term decline in job numbers and now accounts for a smaller part of the State's economy, manufacturing remains a crucial foundation for the Washington State economy. The industry continues to pay high wages, attract research and development dollars, and accounts for the overwhelming majority of the State's merchandise exports.

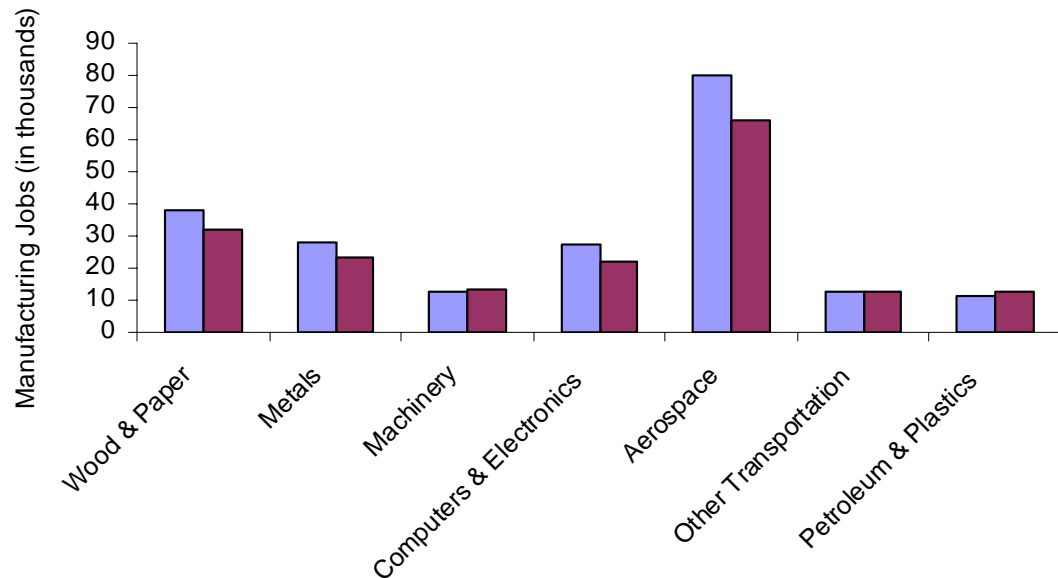
Table A.5 Washington State Industry Profile – Manufacturing

Item	Description
NAICS	Manufacturing (super sector)
Employment	1995 = 311,300; 2005 = 272,000
Contribution to GSP	1997 = \$19.5B; 2004 = \$23.0B
Trend	Extremely competitive; shipments are steady-to-growing, while labor productivity gains and outsourcing reduce job numbers
Suppliers	Wholesale trade, machinery, chemicals, trucking, rubber and plastics, public utilities, machinery, petroleum, primary and fabricated metals, rail
Markets	Manufacturing, wholesale trade, retail trade, export
Rail impacts	Useful in all aspects of manufacturing from inbound movement of supplies/parts to outbound movements of finished products and intermediate goods

Manufacturing in Washington State is dominated by transportation equipment, specifically the aerospace industry. With the presence of Boeing and its suppliers concentrated in the Puget Sound region, there are over 65,000 aerospace jobs in Washington State, more than any other state except California. Wood and paper products, discussed separately, follows aerospace as the second ranking manufacturing industry in Washington State based on employment (see Figure A.4).

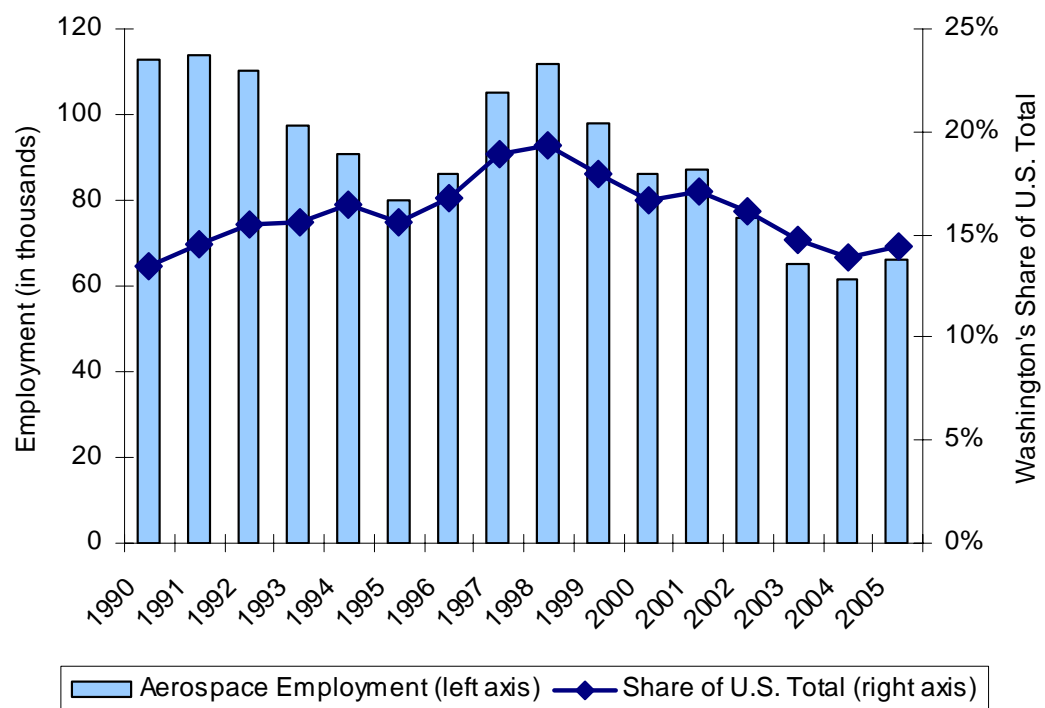
The relative success of Boeing and Washington State's aerospace industry has traditionally been an indicator of the State's overall economic health. While Washington State has diversified and no longer depends on aerospace as it had throughout much of the post-World War II period, Boeing's trajectory (increasing or declining orders and deliveries) still has a tangible effect on the State economy. A rise in aerospace jobs (see Figure A.5) coincided with the State's economic boom in the late 1990s, while the decline in jobs earlier this decade was concurrent with a recession. The recent uptake in Boeing's fortunes has coincided with more robust growth in the State economy. Other industries such as professional and information services have eclipsed aerospace as a source for growth, but the success of Washington State's aerospace industry, as it competes to secure orders from domestic and foreign air carriers, will continue to be a defining factor of the State economy.

Figure A.4 Manufacturing Jobs by Industry
1995 to 2005



Source: Bureau of Labor Statistics.

Figure A.5 After Late 1990s Boom, Washington State's Aerospace Industry in Early Stages of Recovery



Source: Bureau of Labor Statistics.

What and How Much Do They Ship?

Manufacturing and industrial products industries generate significant carload volumes of outbound rail shipments in Washington State. In 2004, the largest tonnage volume of outbound shipments from this industry was waste or scrap materials (1,543,296 tons); followed by pulp, paper, or allied products (1,231,469 tons); transportation equipment (826,102 tons); primary metal products (606,415 tons); and chemicals or allied products (353,040 tons). Inbound manufactured or industrial products include coal (3,000,759 tons); chemicals (1,631,522 tons); clay, concrete, glass or stone (567,284 tons); pulp and paper (564,322 tons); and primary metal products (533,245 tons).

Outlook

What Is the Growth Forecast for the Industry?

While total sales in this sector increased 1.6 percent annually since 2000, the forecast is for even faster growth. Sales are projected to increase 3 percent per year from 2005 to 2010, and slightly more, at 3.1 percent, over the entire forecast period. Output should reach more than \$142.8 billion in 2025. Employment is expected to increase modestly, at 0.2 percent annually, in the short term to 2010. However, it is expected that employment will decrease by 0.5 percent annually over the forecast period resulting in a reduction from 206,653 jobs in 2005 to 188,393 workers by 2025. In 2000, there had been more than 255,000 employees in the Manufacturing industry.

How Will Freight Demand Increase?

The forecast for freight demand in the Manufacturing industries can be found in Table A.6. At more than 127.5 million tons, truck shipped 74 percent of all freight in this industry in 2004. Truck freight tonnage is projected to increase 2.4 percent per year, over the entire forecast, to reach 211.3 million tons by the end of the forecast in 2025.

Air freight is expected to have the highest growth rate of all modes of freight within the manufacturing industries, yet it had the smallest portion of all freight traffic at only 0.3 percent. Air freight is projected to increase 3.3 percent annually from 2004 to 2015 before increasing 5.0 percent annually from 2015 to 2025. By 2025, air freight should reach 1.2 million tons, more than double the 2004 tonnage.

Carload rail service accounted for close to 96 percent of all rail shipments in 2004. The tonnage shipped by carload will increase slightly over the forecast period as carload rail tonnage is expected to increase 1.8 percent annually from 2004 to 2025, while Intermodal rail tonnage is expected to increase 1.4 percent annually over the same period.

Table A.6 Freight Demand Manufacturing

	Manufacturing Sector Shipments, Tonnage by Mode		
	2004	2015	2025
Rail CL	22,055,570	27,464,583	31,763,986
Rail IMX	968,993	1,141,191	1,287,847
Truck	127,537,415	165,385,205	211,315,473
Water	21,183,488	27,566,070	33,352,737
Air	531,830	761,797	1,237,047
	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	2.0%	1.5%	1.8%
Rail IMX	1.5%	1.2%	1.4%
Truck	2.4%	2.5%	2.4%
Water	2.4%	1.9%	2.2%
Air	3.3%	5.0%	4.1%

Some of the major rail using manufacturing and industrial products industries in Washington State are expected to experience significant rates of growth in rail shipments over the forecast period. Waste or scrap materials are expected to surpass major rail commodities including lumber or wood products, coal, and food or kindred products. Transportation equipment is also expected to see robust growth. These two sectors are forecast to have compound annual rates of growth of 3.6 percent and 8.4 percent, respectively, for the period 2004 to 2025.

Supply Chain

How Does Their Supply Chain Work?

Businesses in the manufacturing and industrial products industries use a wide variety of supply chain types but the rail shippers in Washington State use primarily process manufacturing, make-to-stock, and make-to-order supply chains. Process manufacturing supply chains generally have few sites, use a lot of specialized equipment, and operate continuous production facilities whereas make-to-order manufacturing supply chains also have few sites, have limited in and out product flows, and are technologically advanced (Boeing would use this type of supply chain). These supply chains do emphasize low unit cost transportation, reliable service and to a more limited extent (depending on the specific product), speed of delivery.

The Role of Rail in the Manufacturing and Industrial Products Industries

What Rail Services Do They Use?

Manufacturers within Washington State tend to be either major manufacturing facilities that generate large consistent volumes of traffic, or smaller facilities that generate a few carloads at a time. Examples of major facilities include the Boeing plants in Renton and Everett or Tesoro Refinery in Anacortes. Smaller facilities would include General Plastics and Atlas Casting in Tacoma. These facilities rely on the delivery of raw materials and parts by rail to support their manufacturing process and to ship finished products to markets outside the State. They are located off of main line and secondary lines throughout the State's rail system.

Because these industries use carload manifest services, they deal with many of the problems that Class I's and short lines have been having serving this market. Equipment management is reported as a major problem facing the Class I's, especially as they try to move their overall business model to one of high density and standardization. These industries generate demand for a wide range of different car types, and managing this inventory has proven more difficult for the railroads in recent years. In addition, third parties and the businesses themselves are purchasing equipment. Ensuring that equipment is available when needed and gets where it needs to go has been a growing problem that customers in this industry segment complain about.

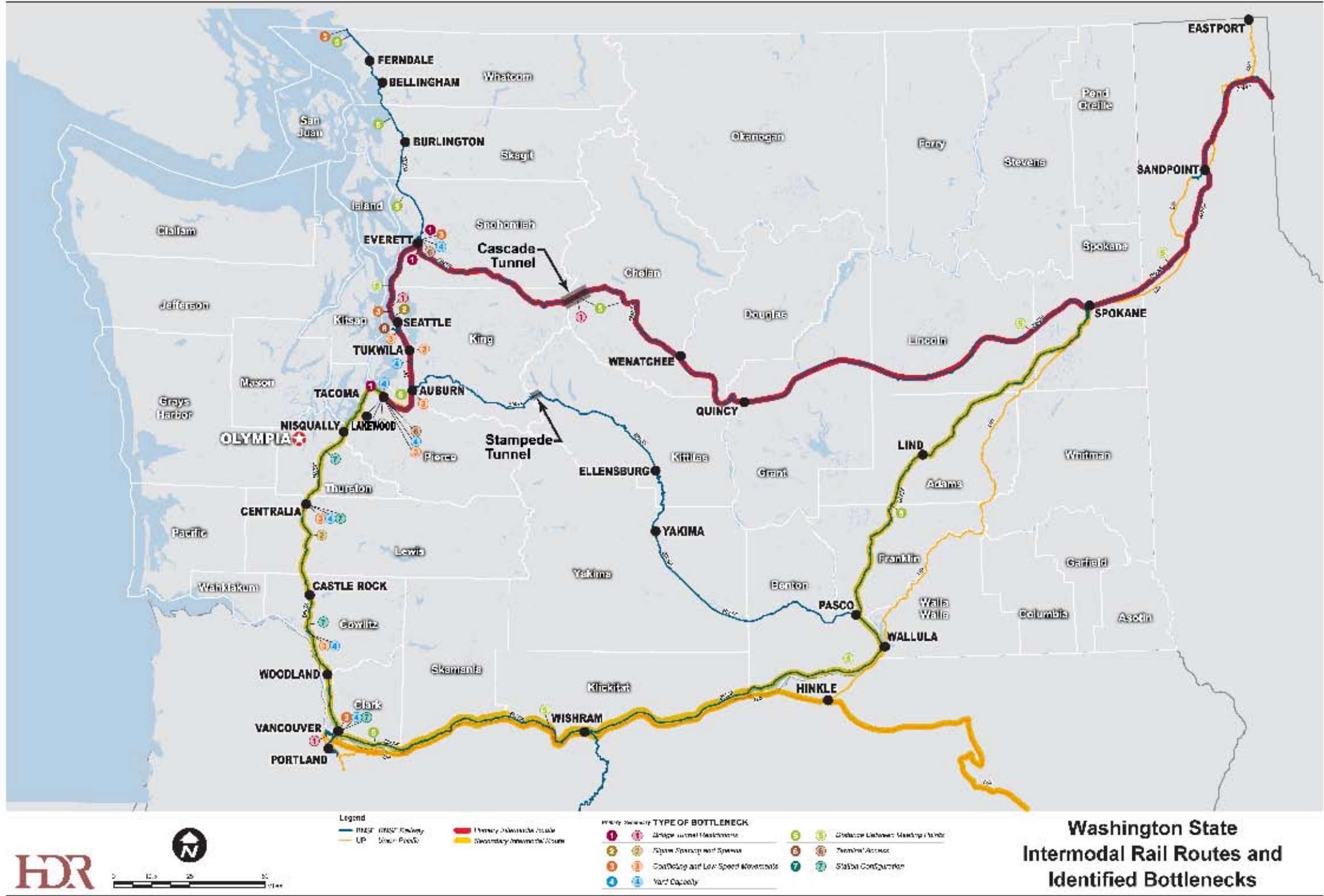
Figure A.6 shows the primary routes and bottlenecks for the movement of manufactured and industrial products. It shows the significance of branch lines, industrial leads, and short lines to this sector. Short lines, in particular, have experienced growth of carload traffic, and they perform an important gathering function in the system. One source of friction between shippers and the Class I carriers in this industry is the increasing demands of the railroads to manage sites and make certain facilities available. The Class I's want to have sufficient storage track, so as to keep loading trains off of main lines and they want particular types of access to train building track. The Class I's are also encouraging more transloading and consolidation in these sectors as they have in the agricultural products sector. To many shippers, this looks like increasing demands at high cost that comes at the same time that rates are going up and service reliability is going down.

What Are the Key Bottlenecks?

Figure A.6 provides a map of key bottlenecks in the rail network for the manufacturing and industrial products sector. Yard capacity is an increasing problem as railroads run longer trains at less frequent intervals. The time cars spend in yards will increase, because longer trains require more switching, and there are fewer departing trains to haul cars out of the yard. As the yards become more congested, shipping times will increase and reliability of service will decrease.

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Figure A.6 Primary Routes and Bottlenecks for the Movement of Manufactured and Industrial Products



Main line congestion is a problem and is caused by short yard switching leads and arrival/departure track. Longer trains must occupy a main track for assembly/disassembly, and this also causes congestion. The specific main line capacity constraints discussed in the sections on both merchandise trade and agricultural products affect manufacturing and industrial products shippers that use the same main lines.

Another problem alluded to earlier is that smaller carload shippers are competing against larger lower-cost shippers for the railroad's limited supply of capacity, power, crews, and railcars. Further, local switching services provided by the railroads to serve businesses located at various points along the main lines must compete for limited main line capacity, increasing operating costs, while delivering a lower quality of service.

What Are the Plans to Serve Future Freight Demand?

The Class I's, short lines, customers, and community economic development interests are promoting a variety of models to address service needs by this sector without significant increases in main line capacity. Some examples are listed below

- Railroads will continue to use technology to minimize the number of times they must handle a car in transit to improve yard operations.
- Short line operators are beginning to work with the communities they operate through to develop industrial zones for smaller carload shippers.
- Railroads are looking to consolidate carload business into load centers to eliminate the need to gather car from multiple sites. Transloading concepts include the following:
 - Expanding business by working with truckers to bring goods to the tracks, hence, the establishment of “transloading.” Transloads are facilities where shippers can consolidate truckload quantities of freight for shipping via rail. It is a profitable strategy, but like the rail network, BNSF's transload network needs to be rationalized. Today, BNSF accesses more than 600 transload facilities, where goods are transferred to or from truck. Twenty of the largest facilities average eight cars per day; however, most transload facilities average less than one car per day.
 - Streamline the transload business by marketing a “preferred” network of transloaders. This will help drive density to fewer, more cost-effective locations, thus, helping the gathering and distribution network operate more efficiently and have capacity for growth. Plus, shippers will see many advantages as these preferred transloaders should be able to operate more cost-efficient facilities, are often located closer to markets, have a strong relationship with BSNF and customers, provide superior inventory management tools, and have the ability to use the company's online tools.

- Build multi-commodity “Mega” Transload facilities that can handle 50 cars per day. BNSF is testing this concept in Joliet, Illinois and Fontana, California. If successful, similar facilities will be explored for Dallas/Fort Worth, the Pacific Northwest, Houston, Northern and Southern California, and other areas throughout the BNSF’s network.

Municipal Solid Waste Industry

Local landfills are difficult to site and construct given today’s regulations. As a result, large regionally-based disposal sites have become increasingly popular. For Washington State, the two primary regional landfills used are the Roosevelt Regional Landfill in Klickitat County operated by Allied Waste; and Columbia Ridge Recycling and Landfill in Arlington, Oregon operated by Waste Management. For distances over 125 miles, solid waste is transported by rail to these facilities. BNSF serves the Roosevelt Regional Landfill and UPRR serves the Columbia Ridge Landfill.

At railroad solid waste transfer facilities, sealed containers of waste are lifted off the transfer trucks and placed on railcars. The containers are transported to the landfill and emptied, and then hauled back to the intermodal site. The intermodal facility significantly reduces transport traffic and cost, because a single train can do the work of more than 100 long-haul trucks on a daily basis.

There are several spot facilities throughout the State where waste containers are loaded from trucks to train cars. These are located in Whatcom County, Island County, Skagit County, Snohomish County, King County, Pierce County, Spokane County, South Thurston, Grays Harbor, Lewis County, and Kitsap County. Railcars are moved from these spot facilities to waste transfer facilities at the Everett Allied Waste Transfer facility, Allied’s Third and Lander transfer station in Seattle’s SODO District, UPRR’s Argo Yard, and Allied’s Solid Waste Transfer facility in Centralia, and then onto landfill sites.

Garbage Trains

Ideally, rail shipments of 120 containers per train are moved from a single origin to a single destination. The travel time and unloading time at the landfills require about two days. This requires that most rail-served transfer facilities operate six days per week in order to keep the solid waste container supply flowing. Solid waste volumes do not typically generate full trains, so the BNSF Garbage train will start in Everett and pickup garbage in Tacoma and Centralia in the way to Roosevelt. The reverse happens when returning the empties. The solid waste in King County and City of Seattle loaded at the Allied Third and Lander and Black River Quarry facilities and Waste Management UPRR Argo facility usually each generate a train a day.

Railroad Constraints to Handling Growth

Solid Waste transport requires better “just in time” service than any other rail shipment. The continual flow of equipment captive to this business is critical as garbage can’t pile up and wait for a container or railcar. As landfills become full and new local landfills more difficult to build the amount of solid waste being exported from densely populated areas to regional landfills will increase. This increase will result in more trains on an already over utilized railroad network. Possible solutions include:

- Additional BNSF mainline capacity between Seattle and Vancouver;
- Additional BNSF mainline capacity between Vancouver and Roosevelt;
- Additional UPRR mainline capacity between Vancouver and Arlington;
- Additional and/or longer tracks at the Roosevelt facility; and
- Additional terminal capacity with long tracks to allow full trains to arrive onto a single track quickly requiring less mainline capacity.

Military

The State of Washington is home to Fort Lewis, one of the largest and strategic military bases in the United States. Fort Lewis, with a land area of 87,000 acres, is the “Power Projection Platform” for the U.S. Army on the West Coast. This implies that it is the Army’s sole military base on the West Coast used for gathering, staging, and deploying military installations during the time of crises. The rail system plays a critical role in supporting military deployments, since it is the primary mode used for carrying heavy military equipment between bases, and to maritime ports of embarkation (The Strategic Rail Corridor Network, STRACNET, consisting of a network of rail routes in the U.S. vital to the movement of military equipment, underscores this critical role.).

The importance of Washington State’s rail system to military deployment activities cannot be over-emphasized, since it not only provides connectivity to Fort Lewis from other parts of the U.S. (during the time of crisis, military units move on STRACNET to the Fort Lewis military base from eastern U.S.), but also provides access to the Port of Tacoma and Olympia, identified by the Department of Defense (DoD) as strategic ports of embarkation.

The military’s primary concerns with regard to the rail system in Washington State pertain to the following issues:

- **Capacity** – On-site capacity of the rail system (rail lines and cars) within the Fort Lewis base in supporting classification, storage, and loading/unloading functions is a primary concern of the military. Currently, the only railroad that has access to the base is the BNSF, serving the base through the Fort Lewis Logistics Center. There are concerns about the rail-car storage capacity of this facility during the time of crisis and there have been talks about refurbishment of the abandoned “North Fort” rail yard northwest to the base, which when completed is expected to increase the rail-car storage capacity of the base by 45 percent. However, renovation of the “North Fort” rail yard is estimated to cost around \$11 million, which is to be funded by the Army in the future.
- **Preservation of rail corridors** – The BNSF Prairie line is a critical link of the rail system in Fort Lewis. However, BNSF has suggested abandoning this line due to low market volumes. The military believes that preserving this line, particularly between Roy and Mobase, while also maintaining the connection with Yelm Prairie line at Roy, is of strategic importance to military deployment operations, partly by providing redundancy with the Sound Transit line and the BNSF mainline, and backup rail access to the base.
- **Running rights** – The military is looking to procuring running rights on the Sound Transit line (between Nisqually and Lakewood); BNSF prairie line (between Lakewood and Mobase, and Mobase and Roy); and Tacoma Rail (part way between Roy and Frederickson) for building train units at the time of deployment.
- **Access to/from Strategic Ports** – Since Fort Lewis is the only Power Projection Platform (PPP) on the west coast, the military foresees the need for military rail deployments to the strategic Ports of Tacoma and Olympia in the future. Consequently, the ability of the rail access routes to support efficient and reliable movement of military units between the Base and the Ports is a critical concern. This relates, in particular, to the impacts of rail operational investments on rail access routes, and their interference with military deployment activity at the time of crisis. For example, if the BNSF prairie line is preserved, it would offer connection at Lakewood with Sound Transit, and could be a potential line for future commuter rail operations. Also, on-dock rail infrastructure at the Ports, especially Olympia, to support military deployment activity is an important issue for consideration.

Issues and Opportunities

A major issue that faces Washington State's manufacturing and industrial products rail shippers is that many of them are captive rail shippers in strong and growing industries. Good rail transportation at low cost is an important element of their supply chains, and recent rail experiences have affected their ability to serve customer needs. Those that are in older sites on low density lines are likely having the biggest problems with their existing rail service. Class I railroads claim to want to serve these markets, but they are often requiring customers to make expensive investments in site upgrades in order to limit capacity impacts of serving these customers. One role the State or local economic development agencies might be able to play is to provide financial assistance to businesses to help make improvements that satisfy a designated set of criteria established in cooperation with the railroads.

A related issue is what opportunity there might be to improve service to the industrial products market by encouraging effective transload and consolidation models. The previous section describes some of the models that are being experimented with by the railroads. Some communities and public port districts are looking to use their rail access as an economic development asset, and they would like to encourage these types of facilities. There may be a role for the State to play in providing assistance to the developers of these facilities.

One issue that came up frequently in interviews with shippers in the manufacturing and industrial products sectors was the possibility of the State assisting with the development of equipment pools, including either or both cars and locomotives. This is a strategy that should be evaluated carefully for several reasons. First, managing this type of pool, where all of the equipment will be used in a relatively confined geographic area (a state), presents some inventory/asset management issues in order to ensure that cars and locomotives come back to where they are needed and they provide for the needs of Washington State shippers and receivers. Further, there may be instances in which additional car supply might have a negative impact on velocity. Some industrial products managers with the Class I's point out that, if a capacity problem is associated with operations and/or infrastructure, increasing car supply could further reduce capacity by pumping too much supply into the system without an effective means of relieving the buildup.

A.4 LUMBER AND WOOD PRODUCTS INDUSTRIES

Industry

Who Are the Lumber and Wood Products Sector Users of the Washington State Rail System and What Benefits Do They Bring to the State?

One of the most significant industry sectors in the Washington State economy is the lumber and wood products industry. This sector includes forestry and log-

ging, lumber for construction and other wood products, and manufactured wood products. Some of the largest lumber and wood products companies maintain significant operations in the State, and they are major users of the Washington State rail system. In addition, Canadian timber and lumber producers use the Washington State rail system to access U.S. markets. Lumber and wood products producers use a wide range of rail services and they are considered by both the BNSF and UPRR as a major market for rail in the Pacific Northwest region.

A profile of the industry and its economic contributions to Washington State is presented in Table A.7.

Table A.7 Washington State Industry Profile
Lumber and Wood Products

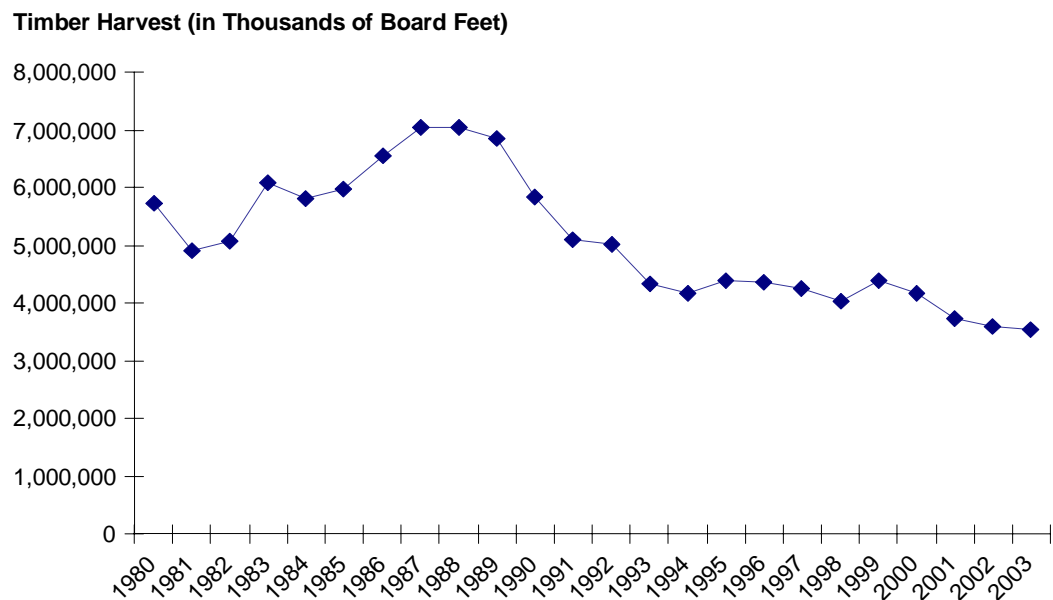
Item	Description
NAICS	Lumber: 111 – Forestry and Logging Wood Products: 321 – Wood Products Manufacturing Paper: 322 – Paper Manufacturing
Employment	1995 = 45,400; 2005 = 37,700
Contribution to GSP	1994 = \$5.1B; 2004 = \$6.5B
Trend	Slow-growth traditional industry with stronger recent growth in lumber due to nationwide spike in residential construction
Suppliers	Paper, wholesale trade, chemicals, trucking, lumber, rubber, public utilities, machinery, petroleum, textiles, railroads
Markets	Paper, printing, food, rubber, clothing, tobacco manufacturing, exports, furniture, chemicals
Rail impacts	Useful in all aspects of paper and fiber manufacturing, from inbound movement of raw lumber and processing chemicals to outbound movement of finished product

Washington State is at the center of North America's most productive forest areas, stretching from Northern California to British Columbia. The State's timber harvest is the second largest in the country, trailing only Oregon's. Among the states, Washington State's wood products shipments (e.g., milled lumber, engineered wood, trusses, pallets, etc.), valued at \$4 billion in 2002, are the sixth highest in the country. The State also ranks sixth in paper production, with output valued at \$3.4 billion in 2002.

After reaching a peak of 7 billion board feet annually in the late 1980s, Washington State's timber production has since declined to about 3.6 billion board feet in recent years (see Figure A.7). However, most of that decline occurred between 1989 and 1994 (coinciding with a massive reduction in timber harvests from National Forests), and recent reports suggest that a growing U.S.

housing market and a strengthening economy are stimulating substantial increases in timber and lumber production in both Washington State and Oregon.³³

Figure A.7 Washington State Timber Production
1980 to 2003



Source: Washington State Department of Natural Resources.

Despite the declines in the timber harvest, the overall outlook for the lumber, wood, and paper industry in Washington State is mixed to favorable. Continued population growth in the United States will feed demand for decades to come. Poor forestry management in Southeast Asia is expected to push Japan and China to source more of their lumber from Canada and Latin America. Washington State is still the largest exporter of wood products in the United States, but Canada has begun to capture more of the Asian market. Canada has become a viable competitor to Washington State in the Asian Markets due to lower wood costs, favorable exchange rates, and greater forecast sector support from the Canadian Government and forecast products industry.³⁴ This shift is, however, expected to reduce competition for domestic suppliers, possibly benefiting Washington State businesses. In North America, improved management practices are helping to sustain the industry, ensuring that productive forests

³³Western Wood Products Association, *Western Lumber Production Hits 14-Year High*, August 1, 2005.

³⁴*Export Trends and the Health of the Pacific Northwest Forest Sector*, Center for International Trade in Forest Products, http://www.cintrafor.org/research_tab/links/Fs/FS41.htm, February 2000, May 2006.

today will remain economically viable in the future. Lastly, increasingly stringent regulations will limit the building of wood and paper mills on new sites. Instead, existing mills in Washington State are likely to be modernized or expanded, a trend that will help keep the industry stable in the State.

While primary wood manufacturing still dominates the Lumber and Wood products industry in Washington State, growth in primary wood products (i.e., logging and lumber) has been falling. Secondary forest products (i.e., doors, windows, and furniture) have shown improvement with moderate growth and employment gains.

Although conditions are generally positive and bode well for the lumber and wood products industry in Washington State, competition from lower priced Canadian pulp can undercut U.S. producers, both domestically and in export markets. Canada already supplies about one-third of the U.S. market for soft lumber (i.e., pines and firs) and has the capacity (British Columbia's forested area is more than three times bigger than the entire State of Washington State) to increase this share. Any reductions on the 21.2 percent tariff currently imposed by the United States on imports of Canadian lumber would challenge Washington State's producers to match low prices that many consider to be below normal market rates.

Outlook

What Is the Growth Forecast for the Industry?

The Lumber and Wood Products industry has experienced increased competition from Canada and other foreign producers, and it shows up in historical sales and employment figures. In fact, this sector has seen a decrease in sales from 2000 to 2005. Sales fell 2.3 percent annually over that time period and are projected to continue their decline. It is estimated that sales will fall at a 3.6 percent compound annual growth rate from 2005 to 2010, and will fall 1.2 percent over the entire forecast.

Employment has fallen further than sales figures, and the outlook for jobs in this industry is for a decline faster than sales. Employment in the lumber and wood products industry decreased 5.6 percent annually from 2000 to 2005, from slightly more than 30,000 in 2000 to about 22,000 jobs in 2005. Employment is expected to continue to fall over the next 5 years by an average of 3.9 percent annually. Over the forecast period, from 2005 to 2025, employment is estimated to decrease 1.7 percent annually.

How Will Freight Demand Increase?

The forecast for freight demand in the Lumber and Wood Products industries can be found in Table A.8. At close to 64 million tons, trucking carried 75 percent of all freight tonnage in this industry in 2004. It is expected that freight truck tonnage will decrease over the forecast. In fact, trucking tonnage should decline

0.2 percent from 2004 to 2015 and 0.6 percent per year over the entire forecast period.

Table A.8 Freight Demand Lumber and Wood Products Industries

	Lumber and Wood Products Sector Shipments, Tonnage by Mode		
	2004	2015	2025
Rail CL	15,620,107	17,889,021	21,094,803
Rail IMX	206,510	129,776	95,056
Truck	63,943,258	59,960,596	61,666,824
Water	5,577,740	5,581,661	6,459,899
Air	2,956	3,693	4,511
	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	1.2%	1.7%	1.4%
Rail IMX	-4.1%	-3.1%	-3.6%
Truck	-0.6%	0.3%	0.2%
Water	0.0%	1.5%	0.7%
Air	2.0%	2.0%	2.0%

Waterborne freight tonnage will be essentially flat through 2015 and can expect to increase 0.7 percent through 2025 in the lumber and wood products category. There were 5.58 million tons of freight shipped by water in 2004. It is estimated that waterborne shipments will increase to 6.46 million tons by 2025.

Intermodal rail tonnage is also expected to decrease over the forecast at a faster rate than trucking. It is expected intermodal rail tonnage will fall 4.1 percent annually to 2015 and 3.6 percent annually over the entire forecast; losing more than one-half of its 2004 tonnage by 2025. Close to 99 percent of all rail freight came from carload, which is projected to increase at a 1.4 percent compound annual growth rate to 2025.

Supply Chain

How Does Their Supply Chain Work?

Lumber and Wood Products industries use primarily extraction and make-to-stock supply chain types. These supply chain types, their performance requirements, and supply chain issues have been described previously in the discussion of farm products and manufacturing industry sectors. The supply chain issues previously described are similar to those of most carload manifest shippers.

The Role of Rail in the Lumber and Wood Products Sector

What Rail Services Do They Use?

Washington State Lumber and Wood Products rail users are a primary market for carload manifest services. This is the third largest commodity by tonnage shipped on the Washington State rail system, and the second largest outbound commodity. Lumber is also the largest commodity by tonnage shipped internationally through the Washington State rail system. Both UPRR and BNSF expect this to be a growth market, and the forecasts prepared for this study suggest moderate growth for rail shipment of lumber and wood products. The Class I railroads both refer to the lumber and wood products sector as a good model for adaptation to their new business model. Lumber and wood products industries are the largest transloaders among industrial products rail users. To some extent, this reflects consolidation within the industry, with the decline of small mills and manufacturers and continued growth among the larger companies (such as Weyerhaeuser). Despite this adaptation, Class I railroads say that this is a difficult market to serve, because of the wide variety of car types used and the demand for the highest load car types. The primary markets for lumber and wood products are in construction, and the markets tend to follow the lowest cost suppliers. This means that the markets are highly cyclical and they shift quickly from one region of the country to another. This creates car supply management difficulties for the railroads, and this has been a continuing complaint of shippers. Even large lumber and wood products manufacturers are looking to modal alternatives, including short sea shipping, as a way to improve the overall performance of their transportation system. Smaller shippers who have fewer options feel captive to the railroads and complain of lack of equipment, poor service, and high rates.

What Are the Key Bottlenecks?

The elements of the Washington State rail system used by lumber and wood products industry shippers and receivers are the same as those of the manufacturing and industrial products sector. Thus, the bottlenecks and issues are the same. The reader is referred to this section of the report for a discussion of these bottlenecks and issues.

Issues and Opportunities

The issues and opportunities for the Lumber and Wood Products sector are similar to those of the manufacturing and industrial products sector. As noted previously, the opportunities to expand and take advantage of new transloading facilities is perhaps greater than for the manufacturing sector as a whole and this has proven successful to date. The management of car supply is a major issue and the state may have a role in assisting smaller shippers with the acquisition of car types that are in high supply and yet are not being provided by the railroads. Clearly investments in off-main line site improvements and support for the short

lines that provide service to smaller captive shippers have particular importance to the Lumber and Wood Products sector.